Railway Engineering Maintenance

Mr. Maintenance Official

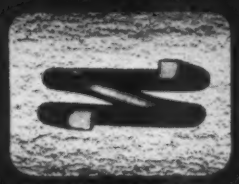
CHICAGO • NEW YORK • DENVER
WASHINGTON • ST. LOUIS

THE P. & M. CO.

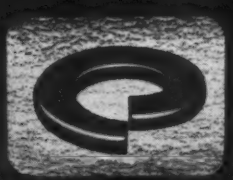
CLEVELAND • ST. PAUL
BOSTON • SAN FRANCISCO

HY-Crome Exhibit

HY-CROME SPRINGLOX

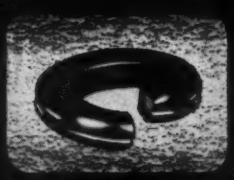


THACKERAY HY-CROME



HY-REACTION HY-CROME

STANDARD HY-CROME



HY-PRESSURE HY-CROME

HY-CROME PRESSURE SPRING

EATON

EATON MANUFACTURING COMPANY

Greetings to the members of the American Railway Engineering Association and the many railroad friends we usually have the pleasure of seeing at the convention and exhibit of the National Railway Appliance Association. We trust the opportunity to revive these mutually profitable get-togethers and Victory will be with us soon.

Reliance Division

SALES OFFICES:

NEW YORK • CLEVELAND • DETROIT • CHICAGO • ST. LOUIS • SAN FRANCISCO • MONTREAL

MASSILLON, OHIO

"ON THE BEAM"
with fewer men and lower cost
Maintain your bridges even though your maintenance crews are depleted.
Just brush on NO-OX-ID protective coating over rust without expensive pre-cleaning.
NO-OX-ID mechanically excludes moisture and oxygen from the surface; chemically inhibits corrosion under the film. Write for further information.
DEARBORN CHEMICAL COMPANY, Dept. U
310 S. Michigan Ave.
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New York • Los Angeles
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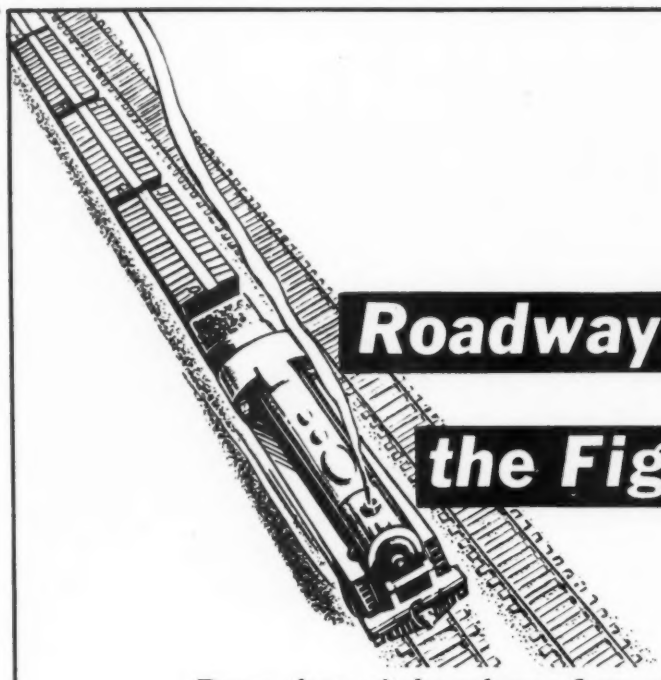
NO-OX-ID
IRON OXIDE RUST
REG. TRADEMARK
AUG. 27, 1918
The ORIGINAL RUST PREVENTIVE

Published monthly by Simmons Boardman Publishing Corporation, 105 W. Adams St., Chicago 3, Ill. Subscription price: United States and Possessions, and Canada, $2.00; Foreign, $3.00. Single copies 35 cents. Entered as second-class matter January 20, 1933, at the post office at Chicago, Ill., under the act of March 3, 1879, with additional entry at Mount Morris, Ill., post office. Address communications to 105 W. Adams St., Chicago 3, Ill.

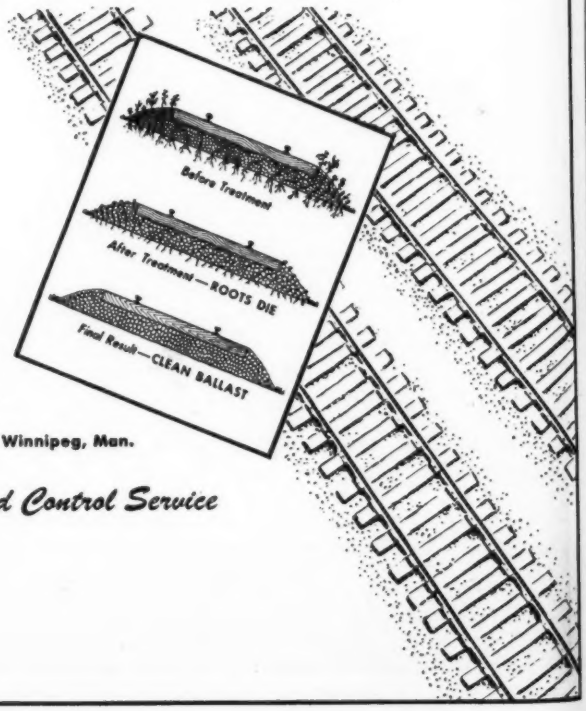


Roadways Leading to the Fighting Fronts

Down these vital roadways flows an endless stream of trains whose burden of fighting men and material is the very life blood of our war effort.

To you maintenance men who are keeping these roadways in such excellent condition, all credit is due. Your unceasing efforts are surmounting all difficulties. Every possible means of conserving manpower is required, and we are proud to contribute towards this accomplishment.

Today, our Atlacide and Atlas "A" Weed Killers are being used throughout the United States and Canada. This fact speaks for itself!



ATLACIDE
CHLORATE WEED KILLER

and

ATLAS "A"
ARSENICAL

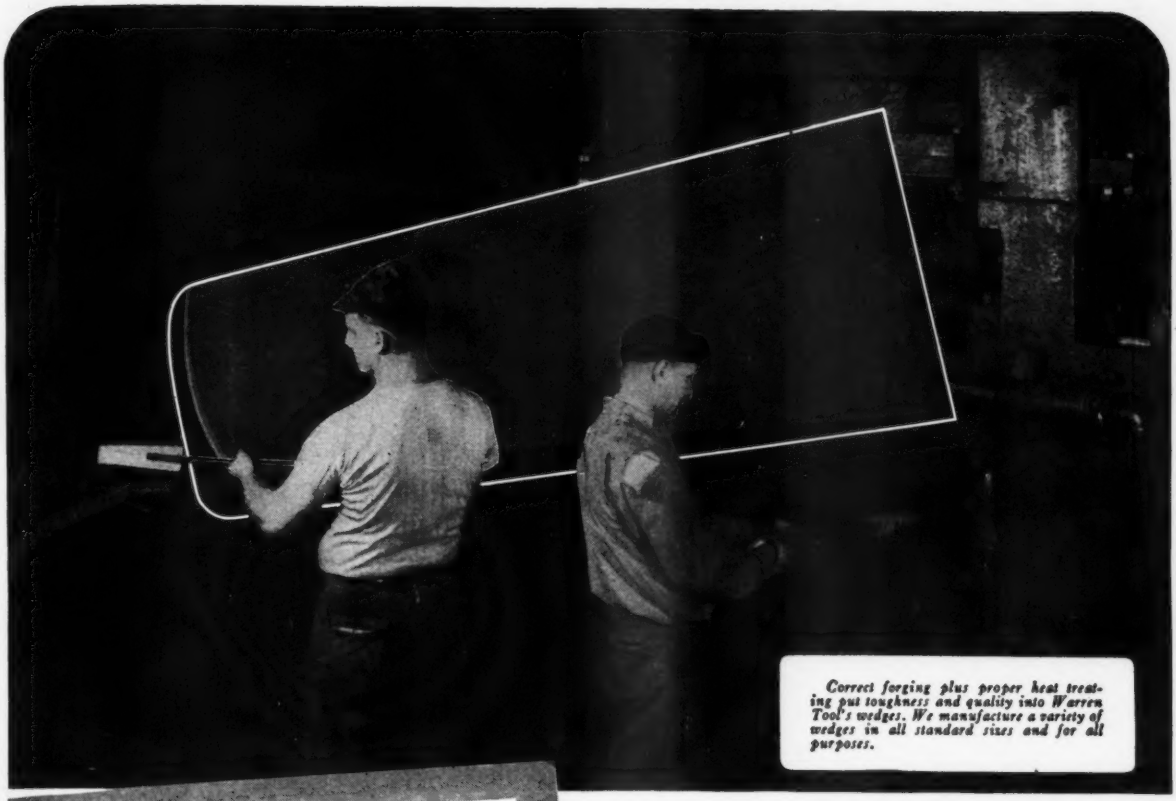
CHIPMAN CHEMICAL COMPANY, Inc.

Chicago, Ill. • BOUND BROOK, NEW JERSEY • Portland, Ore.

Houston, Tex. • Palo Alto, Calif. • No. Kansas City, Mo. • Winnipeg, Man.

Over Twenty-five Years of Weed Control Service

MEMBER 1945



Correct forging plus proper heat treating put toughness and quality into Warren Tool's wedges. We manufacture a variety of wedges in all standard sizes and for all purposes.

WHAT MAKES THE

BIG DIFFERENCE

IN QUALITY OF

HEAVY HAND TOOLS?

To produce the highest quality tools, a company needs this combination . . . right kind of equipment tempered with experienced and seasoned workmen who desire to make leadership products.

At Warren Tool Corp., we forge every tool from specially selected steel. Careful grinding plus right design give sharp dependable edges or bevels and put "the spit and polish" on the faces. Proper heat treating methods add the desired toughness, and we round out the quality with several other finishing operations.

Until the war, Warren Tool Corp., a pioneer in the use of alloy steels for heavy hand tools, manufactured sledges, mauls, picks, mattocks, adzes, track chisels, and other heavy hand tools **exclusively.**

Whether you, **as a hardware man,** sell tools or, as a railroader, use them, you will instinctively recognize in the Devil or Warren-teed lines the good cutting edges, true striking faces, excellent balance, long and safe service.

* * *

Warren Tool is the manufacturer of the famous Devil Line of chisels, mauls, and sledges, made from alloy tool steels, correctly forged and heat treated. All striking faces and cutting edges are ground to templets for just the right angle or bevel and heat treated.

WARREN TOOL CORP. • WARREN, OHIO

WOODINGS Rail Anchors are quickly and positively installed by simply snapping the anchor on the rail. To prevent rail creepage, apply enough anchors. Under-anchored track is a liability.

Millions of
WOODINGS RAIL ANCHORS
are in service

Woodings Forge and Tool Co.

Verona, Pa.

MEMBER 1945 NATIONAL RAILWAY APPLIANCES ASSN.

PUT THE CARS BACK IN SERVICE

QUICKER!

Here's the answer to the problem of getting cars unloaded. With a Northwest Crawler Crane you can get them back in service, where they are needed, more quickly. Your Northwest Crawler will go practically anywhere. It operates along the line, from loading platforms or from the car itself. It will handle any type of material from boxed goods to tie plates and it can be equipped with any type of handling equipment from a magnet to a clamshell bucket. This makes the Northwest a preferred machine for either handling rail maintenance tools and materials, or in store yard work.

Postwar operations are going to call for better service and lower costs. Northwests are serving America's leading railways and have definite advantages that fit them into railway operation. Let us send you details.

NORTHWEST
ENGINEERING COMPANY
1713 Steger Building
28 E. Jackson Boulevard
Chicago 4,
Illinois

PROVED
on the nation's
LEADING
RAILROADS

NORTHWEST

THE ALL PURPOSE RAILROAD MACHINE
SHOVEL • CRANE • DRAGLINE • PULLSHOVEL

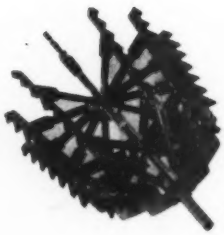
IT TAKES TOOLS, ENGINEERS AND EXPERIENCE TO *REMOVE* DIRT LIKE THIS FROM PIPES

and *WE* have what it takes!

MEMBER 1945 NATIONAL RAILWAY APPLIANCES ASSN.

Many years of experience and our specialized tools and engineers give us the background to clean pipes faster, better and more economically the first time.

Write for information about our complete contractual pipe cleaning service.

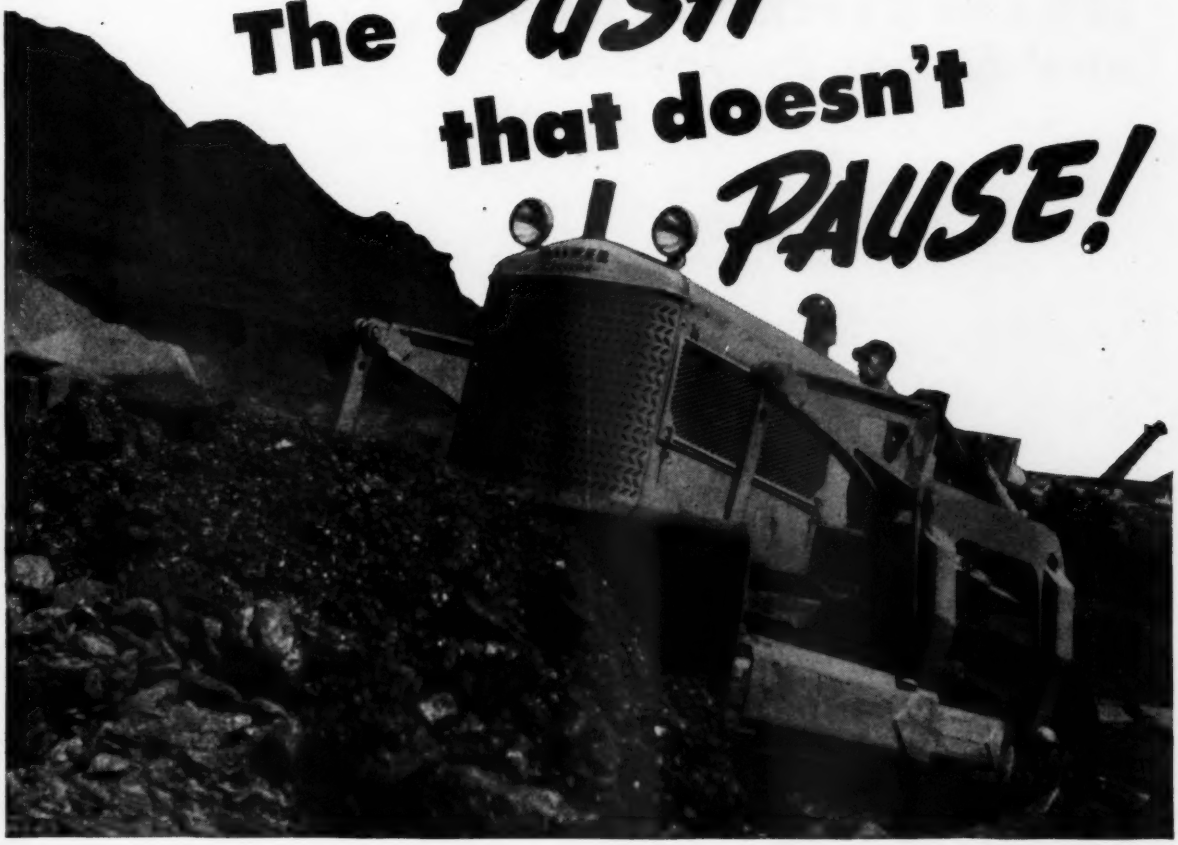


PITTSBURGH PIPE CLEANER COMPANY

433 Melwood Street, Pittsburgh 13, Penna.

PHILADELPHIA • NEW YORK • BALTIMORE • WASHINGTON • CHICAGO • ST. LOUIS • DETROIT

The PUSH that doesn't PAUSE!



They keep pushing! That's why Oliver "Cletrac" tractors move heavier loads . . . faster . . . more economically. Both tracks keep working all the time . . . on the turns as well as straightaway. There's no pause in the flow of pushing power. For only Oliver "Cletrac" gives you *controlled differential steering.*

On any job, push or pull, Oliver "Cletrac's" controlled differential steering principle provides these outstanding advantages. Off-center loads are handled with ease. There's no need to "de-clutch" or "brake" when turning, providing greater safety on hills and slopes. Oliver "Cletracs" don't zig-zag. They steer the same going downhill as up. Power is never disconnected from either track.

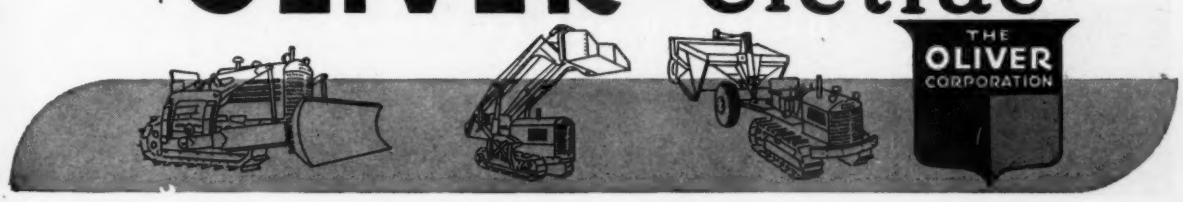
These husky tractors offer other equally important features. And because they are unusually accessible, maintenance is a simple task.

Substantial numbers of Oliver "Cletrac" tractors are now being released for essential use. Your Cletrac dealer will gladly assist you in making application for a new tractor.

The OLIVER Corporation

Industrial Division: 19300 Euclid Avenue • Cleveland, Ohio

OLIVER - Cletrac



Where Traffic Is Heavy and Labor Is Scarce

PATENTED

Specify HUBBARD SUPER SERVICE ALLOY SPRING WASHERS and conserve both track materials and labor.

HUBBARD SUPER SERVICE ALLOY SPRING WASHERS will take up the stretch in track bolts and prevent wear between rails and joint bars. This will decrease the amount of labor for track maintenance.

Service tests have proved HUBBARD SUPER SERVICE ALLOY SPRING WASHERS, even with bolt tensions as high as 30,000 lbs., will prevent joints from freezing.

MEMBER 1945 NATIONAL RAILWAY APPLIANCES ASSN.

New York Office
3712 Woolworth Bldg.
233 Broadway
New York (7), N. Y.

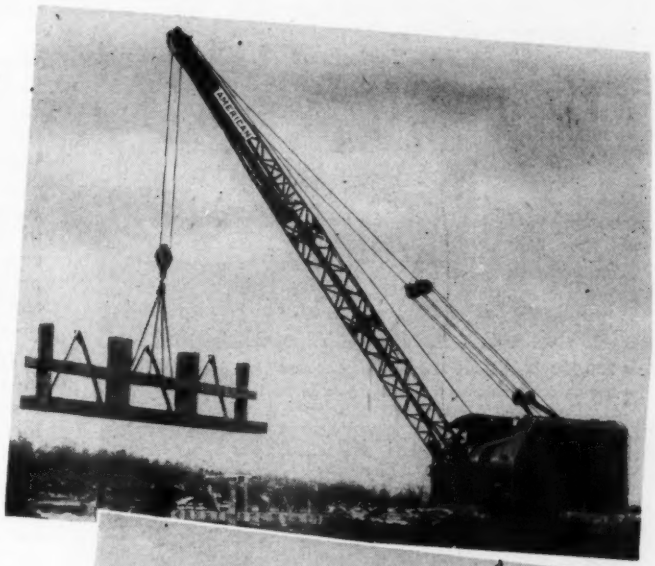
HUBBARD and COMPANY
Tool Division
Manufacturers of Quality Railway Track Tools and Unit Rail Anchors
6301 Butler Street
Pittsburgh (1), Pennsylvania

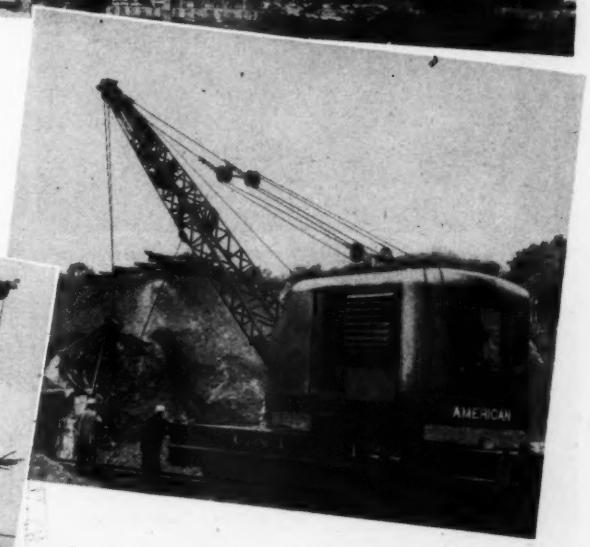
Chicago Office
Room 924
332 S. Michigan Ave.
Chicago (4), Ill.

VERSATILITY with AMERICAN LOCOMOTIVE CRANES

These three pictures illustrate the versatility of the AMERICAN Locomotive Crane as a materials handling method. With capacity and reach, it lends itself readily to hook, magnet, and bucket work. Its ease and convenience of operation and the speed with which it moves from place to place cut a lot of time out of materials handling.

Now is the time to look into improving your materials handling methods. Check up what others are doing with the modern design AMERICAN Locomotive Crane.





4513

Plan now . . . but wait for **AMERICAN!**

AMERICAN **MATERIALS HANDLING** *for* **EVERY INDUSTRY**

AMERICAN HOIST & DERRICK CO.

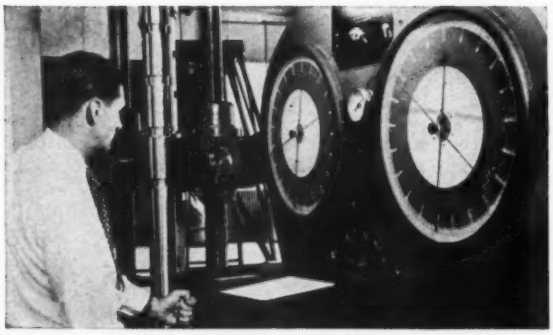
Saint Paul 1, Minnesota

CHICAGO SAN FRANCISCO NEW YORK

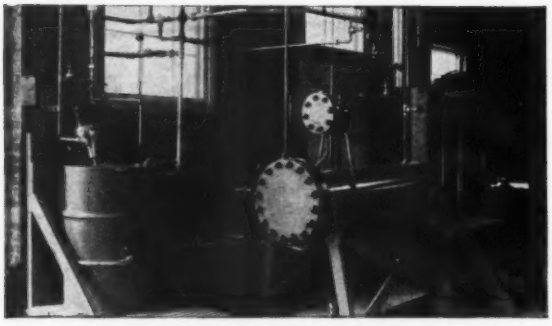
Wherever wire rope is fastened . . . . use genuine **CROSBY CLIPS** *with the Red-U-Bolt*

Ready to Serve You...

TECO Wood Products Development Shop and TECO Wood Chemistry Laboratory



● 200,000 lb. Baldwin-Southwark Hydraulic Testing Machine for tension compression and bending tests on wood.



● Autoclave for Pressure Treating Woods with chemicals and preservatives, Automatic Mixer at left.

● Director of Research and Chief Chemist discuss wood chemistry problem in Teco Chemistry Lab.

More than 200 government officials, engineers, architects, building officials and representatives of the lumber industry attended the formal opening of Timber Engineering Company's Wood Products Development Shop and Wood Chemistry Laboratory at Washington, D. C.

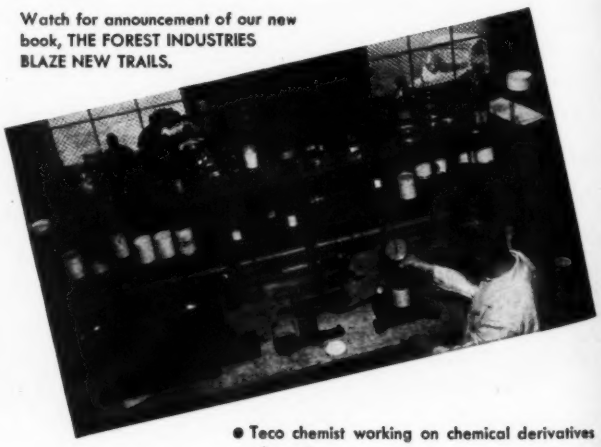
The Wood Products Development Shop has a 200,000 lb. Baldwin-Southwark testing machine; a testing rig equipped to handle trusses up to 50' span; autoclaves and other equipment used in pressure treating; dry kiln and high pressure steam equipment for impregnating; and other facilities for determining the physical and mechanical properties of wood and wood products.

The Wood Chemical Laboratory has modern equipment for investigations in wood chemistry and wood derivatives research. It is giving special attention to lignin research including adhesives, synthetic plastics, etc.

If you have any problems in respect to the physical, mechanical and chemical properties of wood, the technical staff of the Timber Engineering Company may be of assistance on a moderate fee basis. If its own facilities will not solve your problem, it will assist you in locating sources which can.

Consultations at our Washington office may be made by appointment and without obligation on your part. Write us on your business letterhead stating your wood utilization problem.

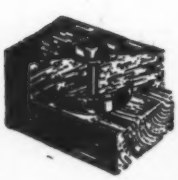
Watch for announcement of our new book, THE FOREST INDUSTRIES BLAZE NEW TRAILS.



● Teco chemist working on chemical derivatives of wood.

TIMBER ENGINEERING COMPANY OF WASHINGTON, D. C.

WASHINGTON ▼ CHICAGO • NEW ORLEANS • SAN FRANCISCO



Specify **TECO**

CONNECTORS AND TOOLS

Endorsed by Leading Lumber Manufacturers and Fabricators

FOREIGN DISTRIBUTORS:

V. H. McIntyre, Ltd., Toronto, Canada • MacAndrews & Forbes, Ltd., London, England • Timber Engineering Company, Sydney, Australia Morle & Company, Ltd., Wellington, New Zealand • The Ford Company, Inc., Panama City, Panama • Standard Machinery & Supply Company, Mexico, D. F.

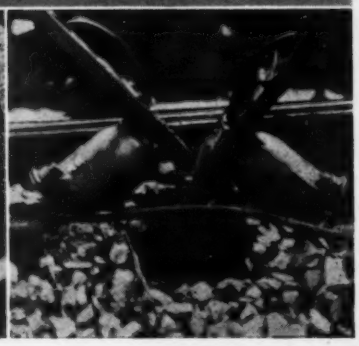
Jackson UNIVERSAL Tampers

The capacity of the JACKSON Universal Tamper to perform specific tamping operations under all conditions justifies its recognition as THE Universal tie tamper.

1 JACKSON ***vibratory*** Tampers are Universal because of their general use on the country's leading railroads.

2 JACKSON ***vibratory*** Tampers are Universal because they operate in all ballasts, in high or low lifts, surfacing or spotting.

3 JACKSON ***vibratory*** Tampers are Universal in applications such as digging out water pockets, cleaning old ballast and ice removal.



The interchangeable blade feature is aptly demonstrated in the illustrations, which show the Universal use of JACKSON Tampers in any kind of ballast. For every job there is a JACKSON-Made tamper blade, whether it be ballast insertion, surfacing, spotting or skeletonizing.

Write for information regarding the use and ease of operation of the Tamper and the various applications of the interchangeable blades.

ELECTRIC TAMPER & EQUIPMENT CO.
LUDINGTON **MICHIGAN**

Oxweld Railroad Service Today . . .

OXY-ACETYLENE END-HARDENING

Rail-end hardening by Oxweld's method lengthens the life of rail in first position by increasing the hardness of the rail right at the point of batter. This flame-treatment not only conserves rail by retarding batter, but by so doing reduces wear on joint bars and bolts. By specifying Oxweld's end-hardening when new rail is laid, railroads can make substantial savings in time and materials.

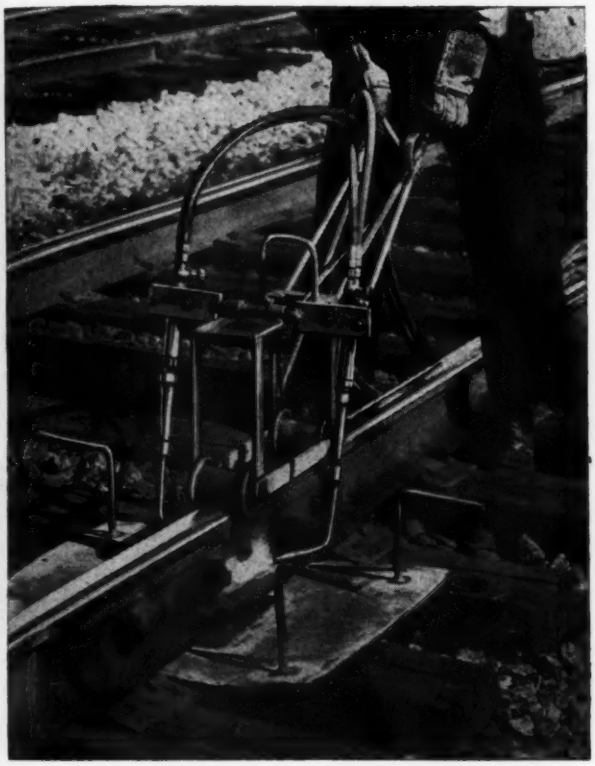
OXY-ACETYLENE FLAME-CLEANING

Flame-cleaning is an economical way to start a long-lasting paint job on steel structures. The oxy-acetylene flame causes residual paint and rust to pop off quickly. Then wire brushing and painting should follow immediately while the surface is warm and dry. This eliminates the major cause of subsequent corrosion, for paint spreads evenly and bonds tightly when applied to a warm, dry surface.

MEMBER 1945 NATIONAL RAILWAY APPLIANCES ASSN.

BUY UNITED STATES WAR

retards Tomorrow's Wear



FLAME-STRAIGHTENING JOINT BARS

Worn joint bars, which permit sag at rail joints and intensify the effects of rail-end batter, can be straightened by localized heating, cooling, and contraction. Oxweld's semimechanized method of flame-straightening requires only one operator. It prolongs the life of the joint bars, provides a more nearly true riding surface, and cuts down the amount of welding required for building up rail ends.

Many future maintenance problems can be anticipated . . . and prevented . . . by applying Oxweld's wear-retarding processes today. For example, the destructive effects of rail-end batter can be minimized in advance by mechanized oxy-acetylene hardening of rail ends.

The Oxweld processes illustrated and explained here are worthy of your *particular* attention *today,* when new materials are hard to get, when experienced track crews are scarce, and when wear is intensified by heavier trains and more of them. Why not review these processes to see how they can simplify your maintenance program? Or ask an Oxweld representative—he will be glad to advise you how to use them effectively.

BONDS AND STAMPS

THE OXWELD RAILROAD SERVICE COMPANY
Unit of Union Carbide and Carbon Corporation
UCC
Carbide and Carbon Building Chicago and New York

A TRACK TEAM

....hard to beat

Here's a team that really comes in first when rapid and efficient tie tamping must be done.

The Air Powered MT-3 tie tampers insure a safe, smooth riding and uniformly tamped track which keeps its alignment and lasts much longer under heavy traffic. The reasons are—ballast is compacted solidly below the ties—water pockets are eliminated—track work fatigue is greatly reduced—all this means that lower maintenance costs are assured.

The Crawl-Air Compressor that furnishes the air power for the tampers moves right along with the job—forward or backward over rough surfaces. It can climb grades up to 40%.

Put this team to work if you want good, sound, smooth track.

MEMBER 1945 NATIONAL RAILWAY APPLIANCES ASSN.

COMPRESSORS • AIR TOOLS

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

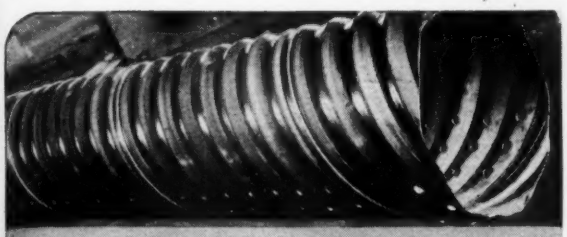
11-617

ROCK DRILLS • TURBO BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • OIL AND GAS ENGINES

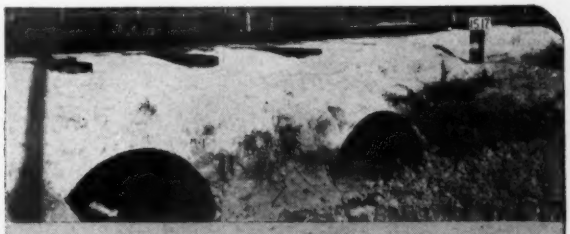
THESE SERVICE-TESTED PRODUCTS

WILL SOLVE YOUR DRAINAGE PROBLEMS

Here are some of the Armco drainage products that can help you cut maintenance costs and assure more efficient drainage systems for your overworked roadbeds.

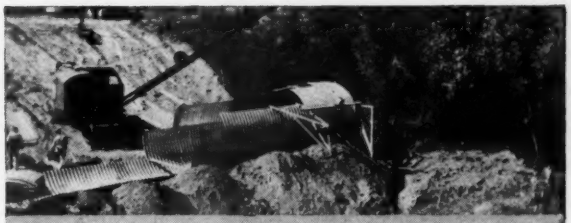


PERFORATED PIPE. Ideal for all kinds of subdrainage requirements. This flexible, sturdy pipe has ample infiltration capacity, will not readily fill up with solids. It is made with circumferential or helical corrugations.

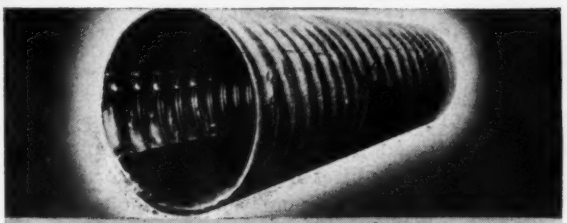


PIPE-ARCH. Pipe-Arch has many advantages when used for low-clearance culverts. For many service conditions Pipe-Arch is provided with bituminous paved invert to resist wear in the bottom.

RETAINING WALLS. These are rugged steel bins completely encased on all four sides. Earth or other material inside the bins gives weight and stability. Walls prevent encroachment of streams or embankment slopes.

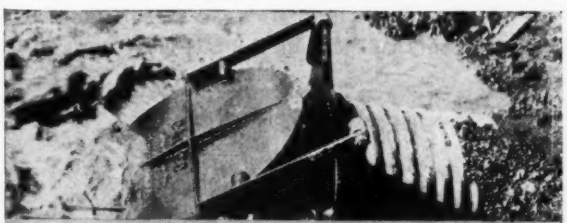


MULTI PLATE PIPE AND ARCHES. Manufactured for pipe (60" to 180" diameters) and for arches (5' to 25' and larger). Excellent for large culverts and small bridges. MULTI PLATE has ample strength for large sizes and high fills.



ASBESTOS-BONDED PIPE. This is a galvanized corrugated pipe with a thick smooth pavement of a special bituminous material over a layer of asbestos felt. Ideal wherever soil or the contents flowing through pipe may cause corrosion.

LINER PLATE. Used for lining tunnels and shafts. These are corrugated, flanged circular segments which are bolted together. Plates are strong though light. Manufactured in two types, standard and heavy duty.



DRAINAGE GATES. Employed for flood control, drainage, sewer outfalls and reservoir outlets. Adaptable to rectangular or circular openings. Calco Drainage Gates are made to fit all standard diameters from 8 to 84 inches.

Write for quotations and additional information. Armco Railroad Sales Co. Incorporated, 831 Curtis Street, Middletown, Ohio.

ARMCO

ARMCO RAILROAD SALES CO. INC.

GOOD SERVICE

IN LINE with its progressive policy to provide customers with good service, Great Northern Railway utilizes Diesel motive power to help move its traffic, and Woolery equipment to keep its roadbeds in first class condition. Woolery Weed Burners, Tie Cutters, and Creosote Sprayers are an important part of Great Northern's program for efficient upkeep of track and roadway.

Over 75 other roads, too, are using Woolery equipment to keep roadbed maintenance on a par with demand.

WOOLERY WEED BURNERS

5-burner, 3-burner, 2-burner and 1-burner models available

WOOLERY MACHINE COMPANY

MINNEAPOLIS — Pioneer Manufacturers of — MINNESOTA

RAILWAY MAINTENANCE EQUIPMENT

RAILWAY WEED BURNERS • MOTOR CARS • TIE CUTTERS • TIE SCORING MACHINES • RAIL JOINT OILERS • CREOSOTE SPRAYERS • BOLT TIGHTENERS

EXCLUSIVE EXPORT REPRESENTATIVES: PRESSED STEEL CAR COMPANY, INC., PITTSBURGH, PENNA.

REQUIRES Good Maintenance

AN OPEN LETTER

WOOLERY MACHINE COMPANY
TWENTY NINTH and COMO AVE. S.E. MINNEAPOLIS, MINNESOTA
DESIGNERS AND MANUFACTURERS OF RAILWAY MAINTENANCE EQUIPMENT

March 1, 1945

To Roadway
Supervisory Officers:

Our hearty congratulations to all of you for the magnificent way in which you have maintained the railway tracks of the country through these war years, under the heaviest traffic in history, and while confronted with almost insurmountable difficulties.

Now you are faced with what promises to be another difficult year, possibly the most difficult to date. Short of experienced men, your tie renewal and weed destruction programs will tax you as never before. Why not let Woolery Machines, designed, proved and tested, help you as they have helped roadway supervisory officers on more than 75 roads in the past, and promise to do a bigger job for these same men in the working season ahead?

A Woolery Tie Cutter, for example, will mechanize any 10-man crew to which it is assigned. With its use the work is made easier. In addition, it is done much better. The compacted bed of the old tie is not disturbed -- the track surface is not affected and retamping is reduced to a minimum. Furthermore, and of the greatest importance, the work is done faster, enabling you to complete your tie renewals in the shortest practicable time.

Woolery Weed Burners are other machines designed specifically to help you, and will release an army of men for more constructive essential work in your busy season ahead. In the Woolery 5-burner, 3-burner, 2-burner and 1-burner models, there's a unit to meet your every need -- on main and branch lines, in yards, and off-track at station grounds and other points where objectionable weed growth must be kept under control.

If you are not acquainted with the outstanding advantages of these machines, we solicit an opportunity to show you how Woolery Tie Cutters and Weed Burners can lighten your load in the season ahead. We are at your service and await your needs.

Yours very truly,

WOOLERY MACHINE CO.

H E Woolery

President

MEMBER 1945 NATIONAL RAILWAY APPLIANCES ASSN.

announcing

The Thompson RAIL and TIE PLATE CLAMP

Thompson Rail and Tie Plant Clamps maintain resilient pressure upon rail base and tie, prevent rail creepage, permit necessary rail flexing.

Holds rail and tie plate firmly on the tie without bouncing or hammering effect. Prevents tie plate shifting and wood abrasion.

Only one *fastening member*. Avoids costly over-spiking and excessive tie splitting. Saves ties, labor and reduces upkeep expense.

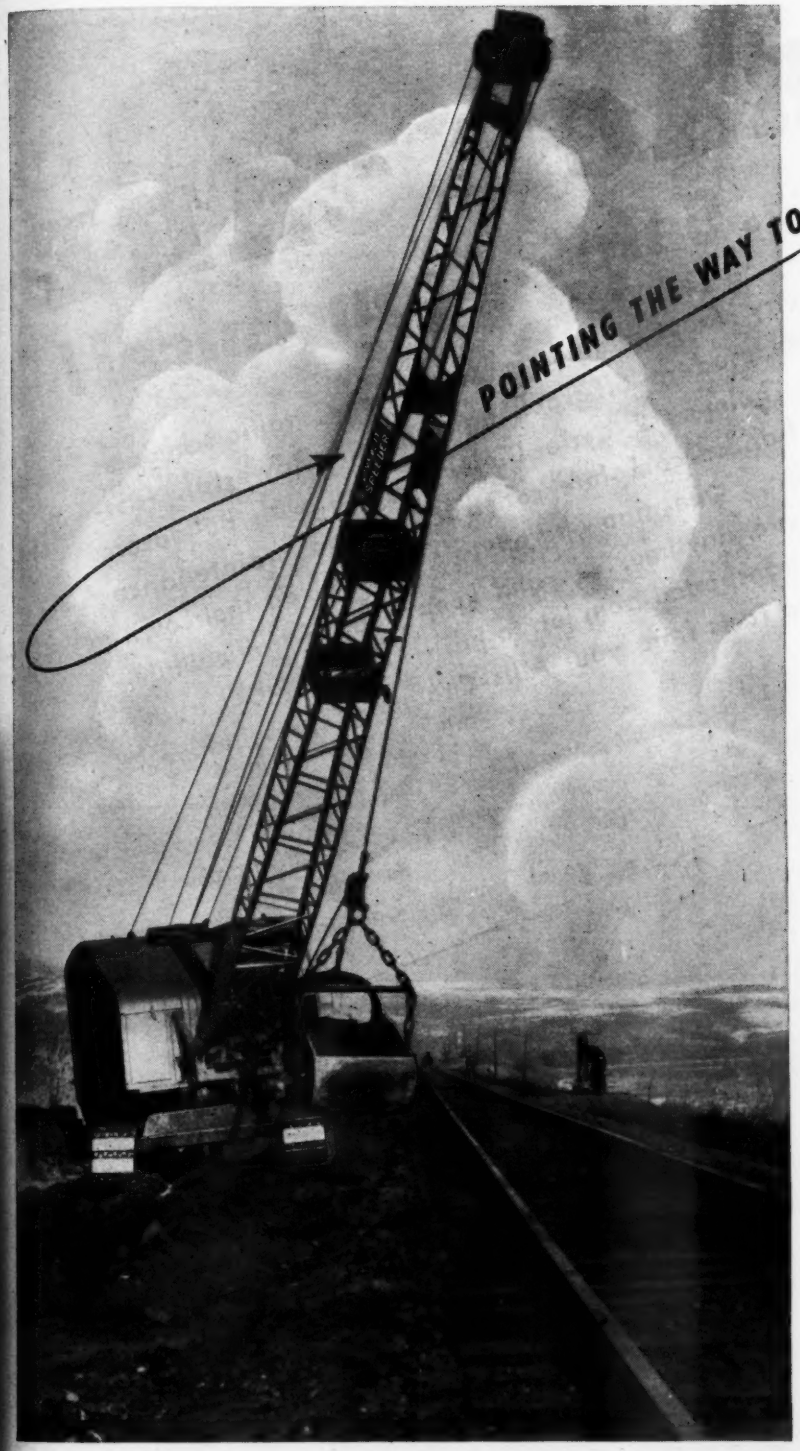
These clamps are treated with a rust inhibitor to assure long, efficient service.

For further information on the economy and efficiency of this modern track fastening, write:

Thompson Products, Inc.

Railroad Accessories Division **CLEVELAND 3, OHIO**

MANUFACTURERS OF AUTOMOTIVE AND AIRCRAFT PARTS AND ACCESSORIES



POINTING THE WAY TO POST-WAR EFFICIENCY!

ON THE

UNION PACIFIC

—Keeping Maintenance Work

MOVING FAST

with a

LINK-BELT SPEEDER

High speeds will be the order of the day during post war and fast, economical banking, ditching, grading and maintenance will spell success in maintaining much of the present traffic peak for post war revenues!

LINK-BELT SPEEDER

Builders of the Most Complete Line of

SHOVELS-CRANES-DRAGLINES

LINK-BELT SPEEDER CORPORATION, 301 W. PERSHING ROAD, CHICAGO 9, ILL.

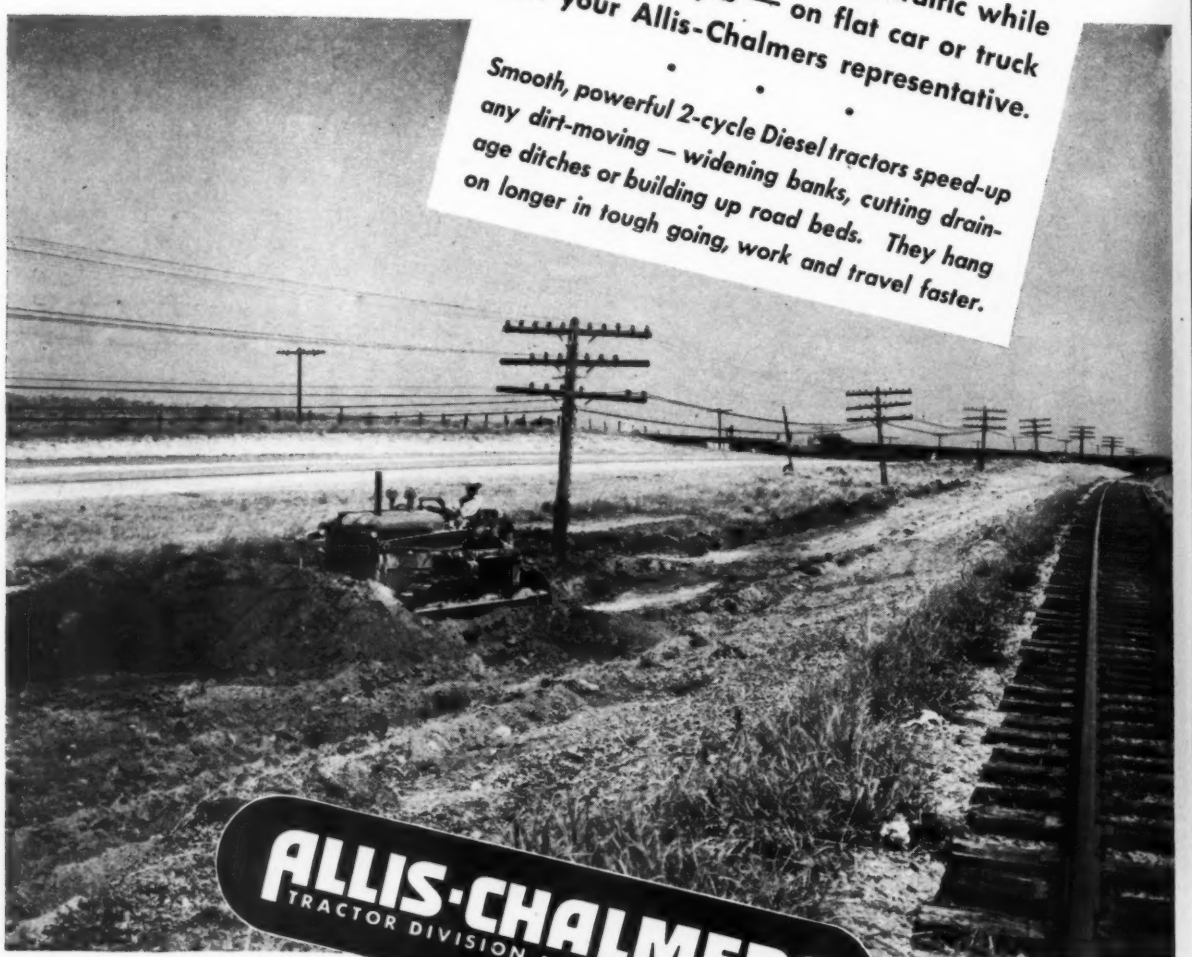
A DIVISION OF LINK-BELT COMPANY

TRACK CARE
Fast . . Safe . . Economical!

● Reduce worry about manpower, work trains, traffic schedules, accidents. Use modern off-track equipment. Powerful, fast-working Allis-Chalmers 2-Cycle Diesel tractors, with bulldozers and scrapers, handle complete construction and maintenance . . . start to finish. One-man operated . . . travel on their own tracks, go anywhere, anytime . . . and keep clear of traffic while working. Easily transported from job to job — on flat car or truck trailer. Get all the facts from your Allis-Chalmers representative.

• • •

Smooth, powerful 2-cycle Diesel tractors speed-up any dirt-moving — widening banks, cutting drainage ditches or building up road beds. They hang on longer in tough going, work and travel faster.



ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

CLEAN BALLAST

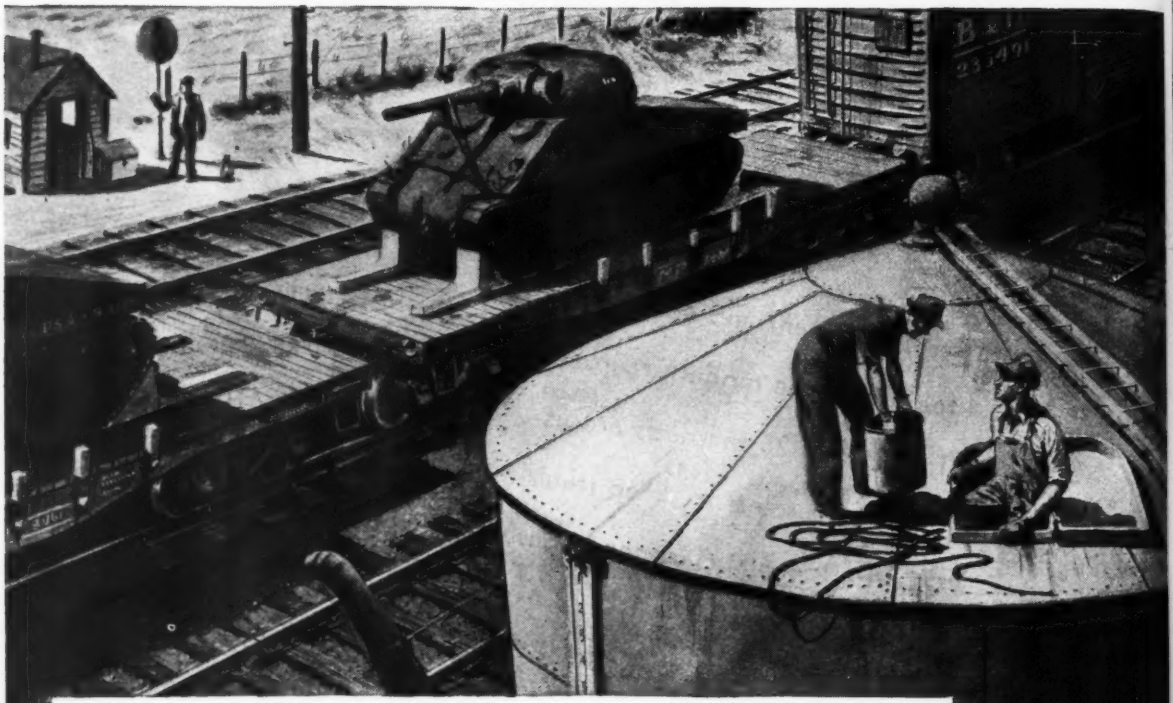
is an important and economical feature of the modern railroad. That is why 28 railroads are using 265 Moles to keep their roadbeds in first class condition.

McWILLIAMS "MOLE" BALLAST CLEANERS ARE AVAILABLE IN BORDER AND INTERTRACK MODELS

MEMBER 1945 NATIONAL RAILROAD APPLIANCES ASSN.

Write Today For Complete Information

RAILWAY MAINTENANCE CORP.
PITTSBURGH 30, PENNSYLVANIA



Drinking Trough for the Iron Horse

A locomotive must have its water supply of an assured quantity and quality. Drinking troughs for the iron horse stand along the rails at intervals across the country.

Exposed to every extreme of weather, protection against corrosion . . . inside and out . . . is vital to these railroad water tanks.

You can provide this protection with Flintkote Hydralt Emulsion.

Not only for water tanks . . . but for pipelines, signal towers, bridges, buildings . . .

Any metal or concrete surface exposed to water, weather, corrosive fumes or other destructive factors, can be given durable, economical protection with Flintkote Hydralt Emulsions.

These coatings are non-toxic in application, odorless and tasteless. Use them safely anywhere . . . even to protect the inside surfaces of tanks for drinking water.

Applied cold and applied quickly . . . with trowel, brush or spray . . . Hydralt Emulsions form a durable film of protection that will outlast any other form of asphalt coating.

There are many types of Flintkote products for railroad use, including the widely used Car Cements and Mastics. Write us for more information. Extensive research facilities and more than forty years' experience are at your service.

FLINTKOTE
INDUSTRIAL PRODUCTS

THE FLINTKOTE COMPANY • 30 Rockefeller Plaza, New York 20, N. Y.
INDUSTRIAL PRODUCTS DIVISION
Atlanta • Boston • Chicago Heights • Detroit • Los Angeles • New Orleans • Waco • Washington • Toronto • Montreal

GOOD MAINTENANCE EQUIPMENT DESERVES GOOD MAINTENANCE MATERIALS

• With manpower scarce . . . and traffic heavy . . . it's more important than ever to keep work equipment in A-1 condition.

When maintenance on this equipment becomes necessary, use Johns-Manville specialized packings and friction materials. It is one of the best forms of "trouble-free insurance."

J-M Packings are made in specialized forms for all types of service equipment . . . from creosoting tanks to water-treating stations and air compressors.

J-M Friction Materials are available in special sizes and types for cranes, draglines, tractors and other roadway equipment.

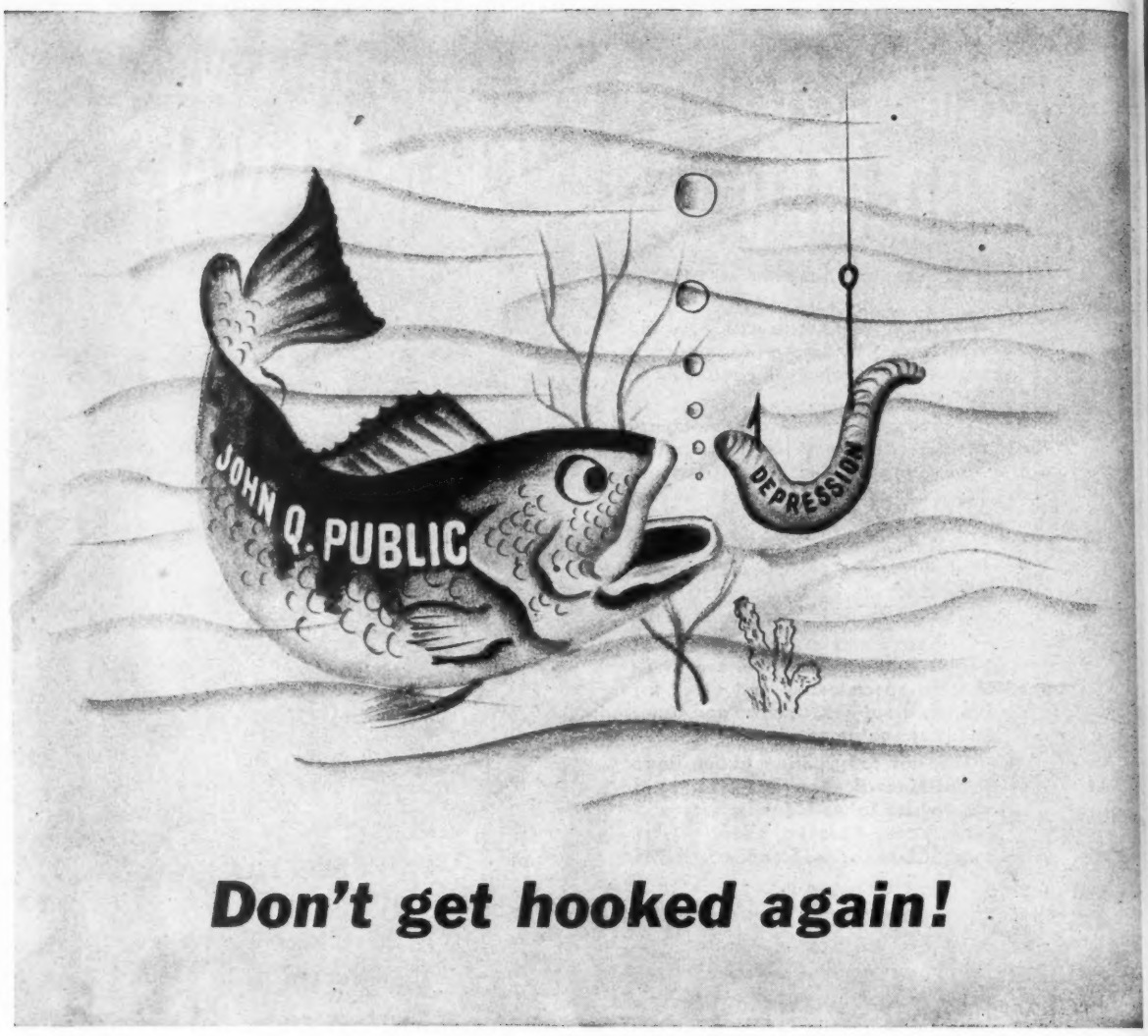
For full information about these Johns-Manville Materials for railroad uses, write Johns-Manville at New York, Chicago, Cleveland, St. Louis or San Francisco.

JOHNS-MANVILLE PRODUCTS

Johns-Manville

87 YEARS OF SERVICE TO TRANSPORTATION

Insulations • Packings • Friction Materials Refractory Cements • Building Materials



Don't get hooked again!

Only yesterday (YOU remember!) men sold apples on the streets, saw their furniture go back to the store, lost their houses, lost their farms. Will it happen again? It needn't.

But to avoid the kind of depression we had after the last war—WE MUST HEAD OFF INFLATION NOW! And the best way to do that is to save your money.

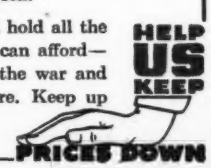
When you don't buy a thing you can get along without . . . *that's helping to prevent inflation.* When you decide this is a bad time to ask more money for the things you sell or to fight for a raise . . . *that's helping to prevent inflation.* When you pay up all your debts . . . *that's helping prevent inflation.* AND SOMETHING MORE!

It's the best way to protect yourself against a depression if one should occur, *and* the best way to prepare yourself for tomorrow's opportunities if times are good.

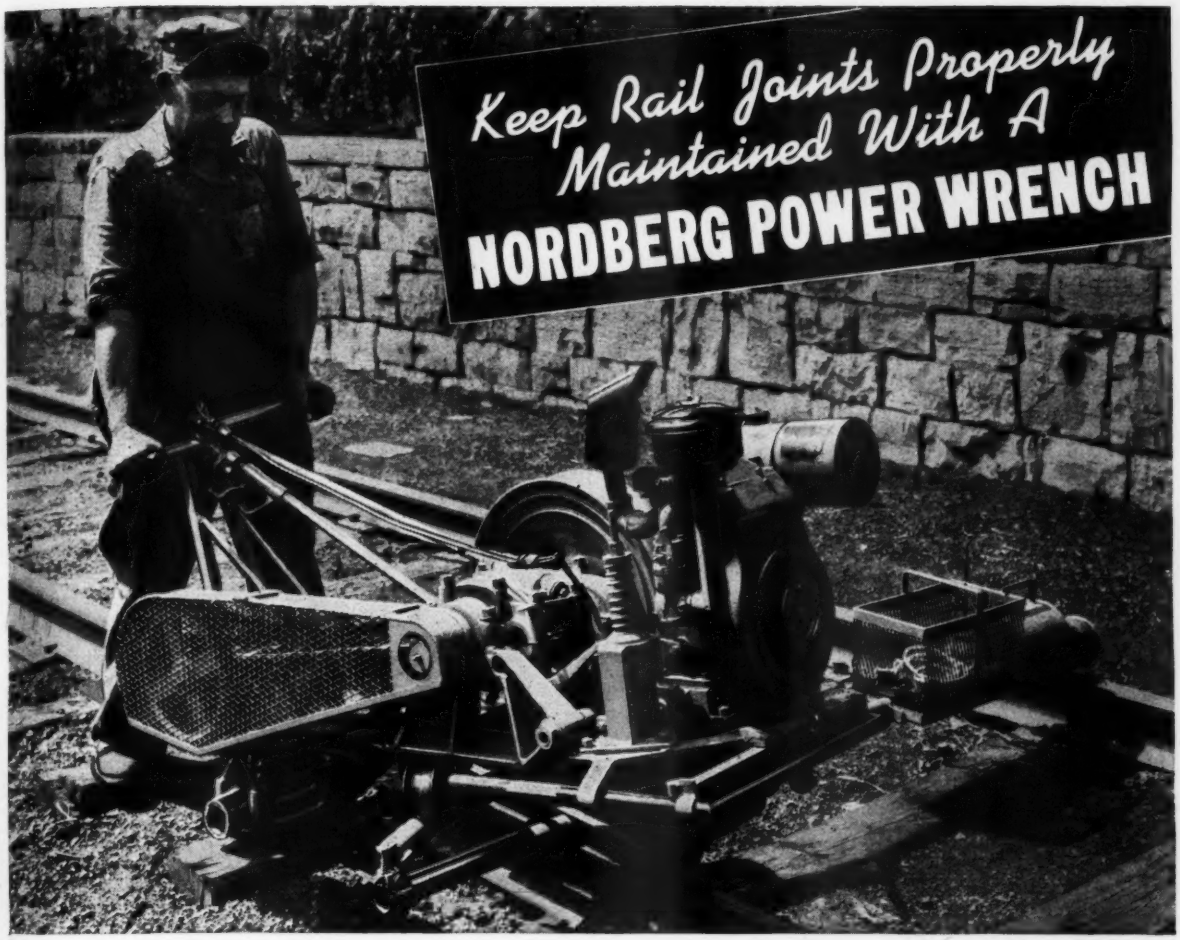
The smart thing today is to save, not splurge. Don't get hooked again!

4 THINGS TO DO to keep prices down and help avoid another depression

1. Buy only what you really need.
2. When you buy, pay no more than ceiling prices. Pay your ration points in full.
3. Keep your *own* prices down. Don't take advantage of war conditions to ask more for your labor, your services, or the goods you sell.
4. *Save.* Buy and hold all the War Bonds you can afford—to help pay for the war and insure your future. Keep up your insurance.



A United States War message prepared by the War Advertising Council, approved by the Office of War Information, and contributed by this magazine in cooperation with the Magazine Publishers of America.



● Nuts Accurately Tightened

Adjustable overload release assures uniform tension on all track bolts. Variation of torque on nuts is not more than 5 percent.

● Greater Speed — More Power

Rapid progress with ample power for starting "frozen" nuts is possible with two socket speeds--122 rpm on high and 35 on low.

● All Nuts Easily Reached

The sockets on the swinging wrench arm easily reach nuts at inside and outside of rail and at switches, frogs and crossings.

● Accessories Available

Accessories adapting the wrench for driving screw spikes and for drilling rail can be furnished as extra equipment.

NORDBERG POWER TOOLS for maintenance jobs

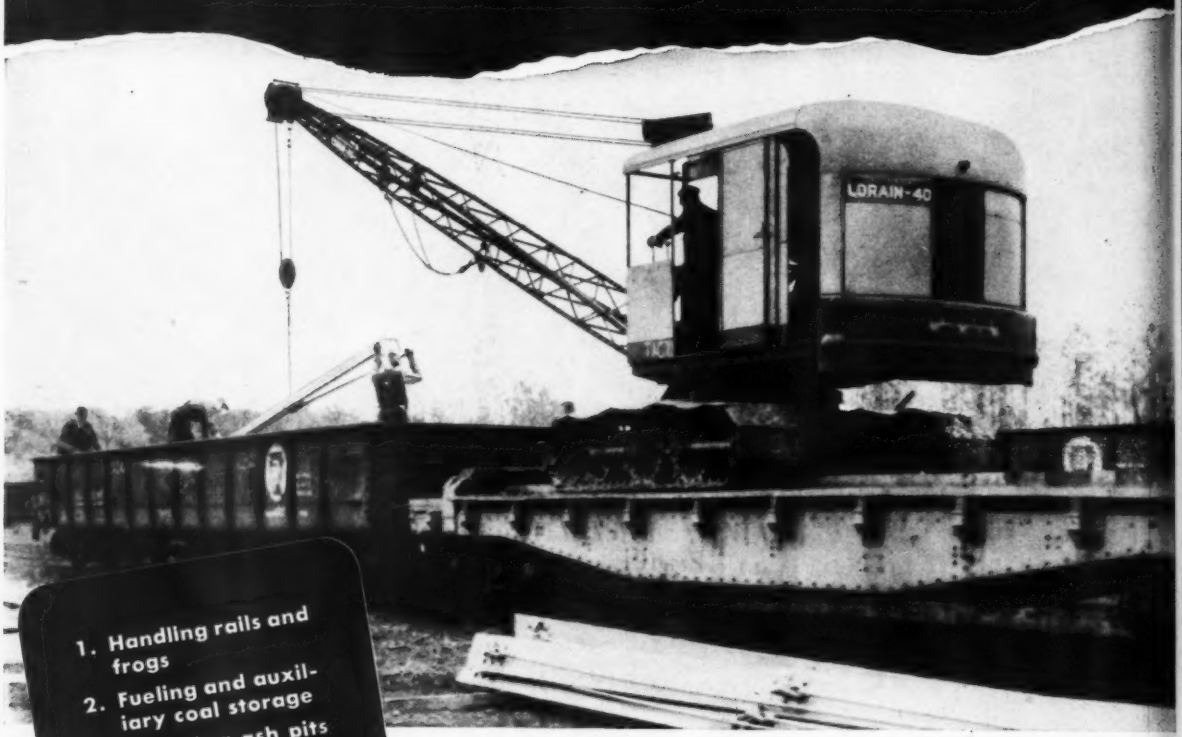
Power Wrench
Adzing Machine
Spike Puller
Rail Drill
Power Jack
Surface Grinder
Utility Grinder
Midget Grinder
Flexible Arm Grinder
Track Shifter

NORDBERG MACHINERY

NORDBERG MFG. CO. MILWAUKEE WISCONSIN

Export Representative—WONHAM Inc.—44 Whitehall St., New York

DO THESE 10 JOBS FASTER, CHEAPER WITH LORAIN CRANES



1. Handling rails and frogs
2. Fueling and auxiliary coal storage
3. Cleaning ash pits
4. Handling scrap
5. Storekeepers yard and road service
6. Cleaning ditches
7. Cleaning ballast
8. Team track and material handling
9. Heavy lifts of all kinds
10. Bridge and other construction

TO the basic economy of having a single mobile machine handle so many railroad jobs, Lorain cranes add a flexibility and efficiency of operation that is helping to cut costs on roads throughout the country. Today, on many jobs a single operator can do the work that once required 50 men.

Built by makers of shovels and cranes exclusively for 50 years, Lorains embody every tested feature of up-to-date shovel engineering.

15 Machines In One!

Flexibility, alone is a good example of Lorain value. Any Lorain crane you buy can be used with these 15 different work attachments:

Magnets	**Skips**	**Slings**	**Tongs**
Clamshell Buckets	**Grabs**	**Grapples**	**Hairpin Hooks**
Dragline Buckets	**Concrete Buckets**	**Skull Crackers**	**Clamps**
Orange Peel Buckets		**Hook Blocks**	**Special Hooks**

The complete line includes large and small crawler mounted cranes; rubber-tired, highly mobile Moto Crane; rubber-tired Self-Propelled Cranes. Ask for complete performance data and literature—plan now to cut costs this modern way with Lorains.

Reg. Trade Mark

thew Lorain

THE THEW SHOVEL COMPANY
LORAIN, OHIO

CRANES • SHOVELS • DRAGLINES • MOTO-CRANES

FOR LOW-COST ALL YEAR MAINTENANCE

Any hour of the day, any day of the year, a portable Barco Unit Tytamper is ready to tackle the toughest, most stubborn jobs along the right-of-way. Adverse weather cannot slow down a Barco's battering attack; hot weather never tires out this husky worker. And low operating costs keep Barco Tytampers earning profits for users throughout long years of service. Write for complete details.

BARCO

UNIT TYTAMPERS

THE FREE ENTERPRISE SYSTEM IS THE SALVATION OF AMERICAN BUSINESS

BARCO MANUFACTURING COMPANY, NOT INC., 1805 Winnemac Ave., Chicago 40, Ill. • In Canada: The Holden Co., Ltd., Montreal, Can.

NOW you can get a NEW Homelite Portable Pump

The new Model HR Homelite Self-priming Pumps are now coming off our production line.

However, only a few are being built . . . a limited quantity each month for essential civilian use. Your priority rating is your "ration coupon."

True to Homelite standards, these gasoline-engine-driven self-priming pumps are easily portable and extremely rugged. They have a large capacity . . . 28 foot suction lift . . . keep seepage at strainer level . . . and are non-clogging, foolproof and weatherproof. A new engine design gives increased power . . . with a reduction in weight.

These new Homelite Pumps can be furnished with fittings for 2″ or 3″ hose . . . and the two size fittings are interchangeable.

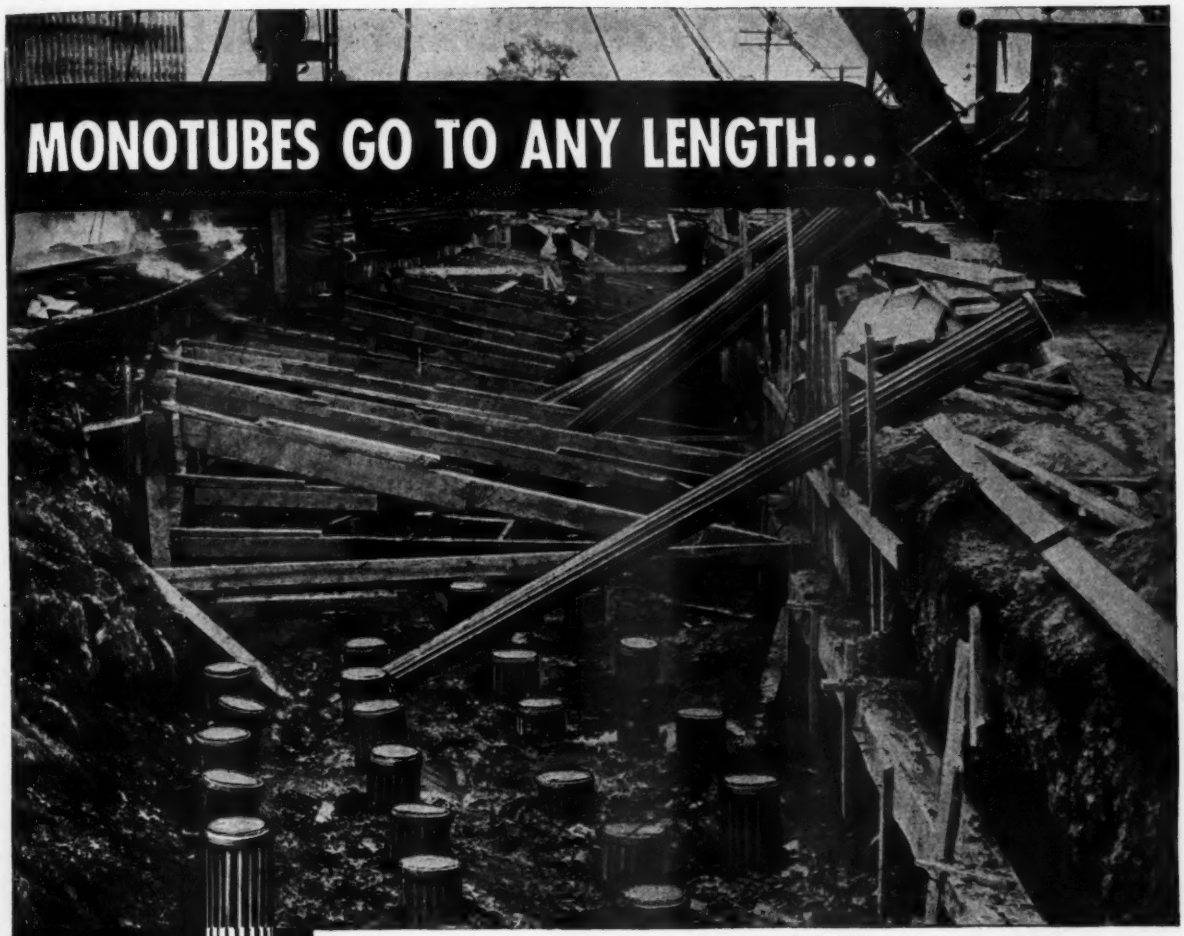
Write today for complete information and prices on these new Model HR Homelite Portable Pumps. Don't forget to give us your priority rating.

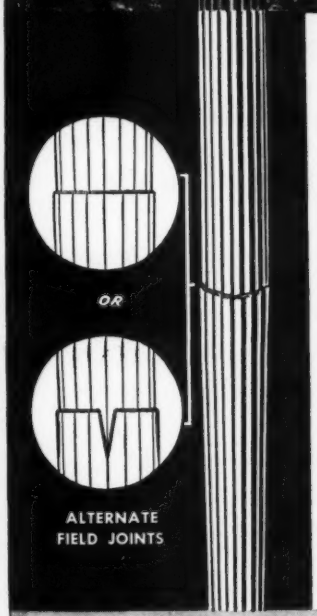
HOMELITE CORPORATION

PORT CHESTER, NEW YORK

***PORTABLE* PUMPS • GENERATORS • BLOWERS**

MONOTUBES GO TO ANY LENGTH...





. . . to insure a BETTER FOUNDATION

TO the engineer and contractor Monotube tapered piles offer many advantages—among them: ease of *handling,* ease of *driving,* ease of *inspection.* But the Monotube feature that rates tops with men of experience is their EASE OF EXTENSION.

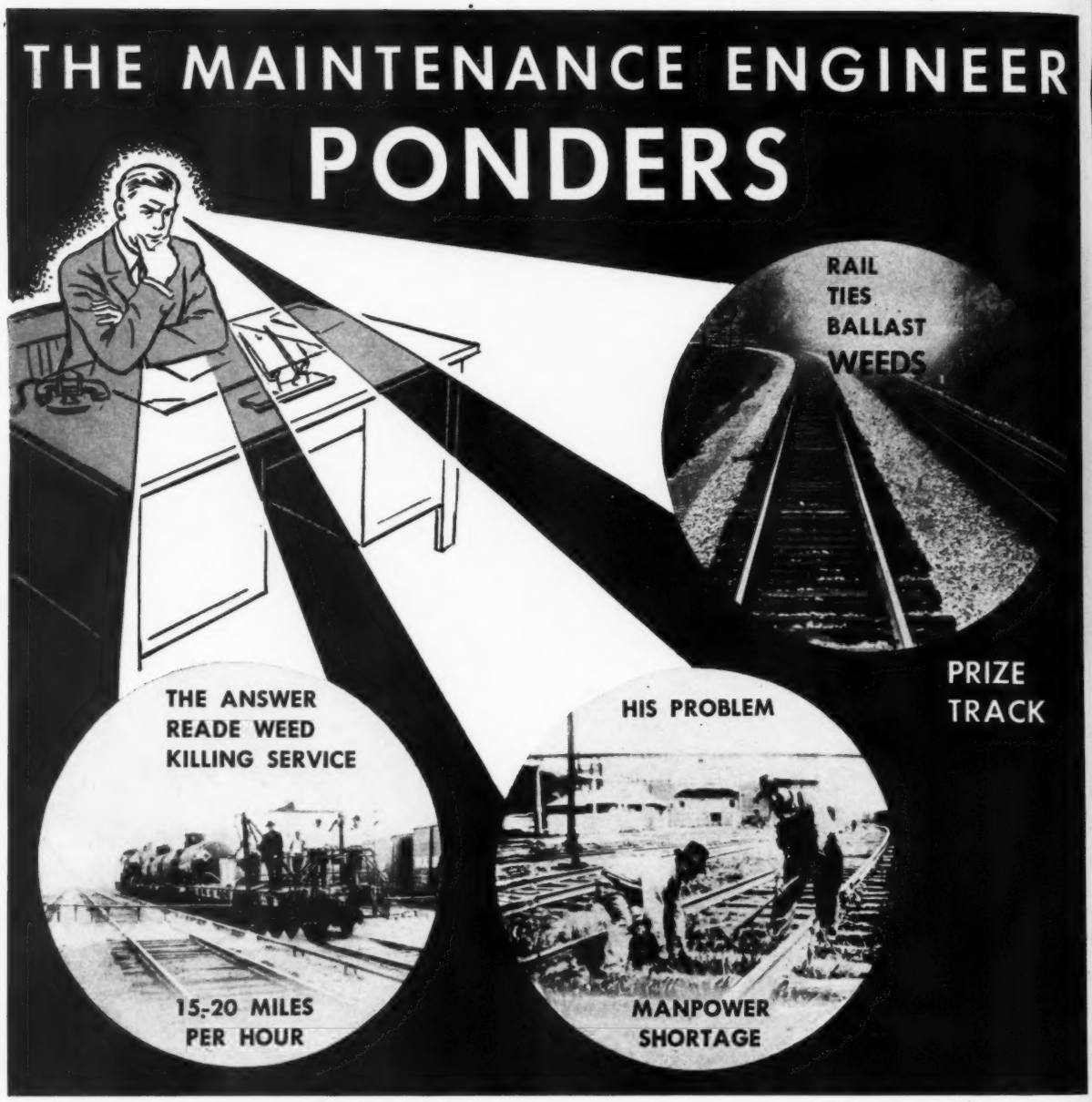
Tapered, fluted Monotubes are so light in weight, so efficiently designed, they can be driven without heavy core or mandrel, and quickly extended on the job to meet any contingencies of varying soil conditions.

Remember Monotubes the next time you require piled foundations. Available in a gauge, size and taper to meet your needs. For full details and catalog, write The Union Metal Manufacturing Company, Canton 5, Ohio.

UNION METAL

Monotube Tapered Piles

THE MAINTENANCE ENGINEER PONDERS



WEED CONTROL without MAN POWER

The most effective salesmanship in our line of business can be brought to bear if a man considering a weed control program is persuaded to ride one of our contract spray trains for a few hours.

The sense of accomplishment as a double or three track spray train moves at fifteen miles or more per hour is in striking contrast to the accomplishment in using any other available method for weed control work.

Equally convincing are the results observed when inspecting the weeds a day, a week or a month after the track was sprayed with READE WEED KILLER.

Year after year the large systems spread chemical as they observe the improved condition of roadbed. Reduced growth each year creates an attitude on the part of management where they regard the program as one that involves prevention as well as the cure of the problem.

A weed-free roadbed inspires pride in good maintenance.

CONSULT US ON YOUR WEED CONTROL PROGRAM

MEMBER 1945 NATIONAL RAILWAY APPLIANCES ASSN.

READE MANUFACTURING COMPANY

135 Hoboken Ave., Jersey City, N.J.

SERVICE HEADQUARTERS AT 9500 Cottage Grove Ave., Chicago, Ill.

Without any interference to traffic, the Drott Bullclam Shovel handles this berm grading for Colorado and Southern Division of Burlington R. R. Before and after photos, taken near Channing, Texas, illustrate the clean job this unit does.

..DROTT BULLCLAM SHOVEL Makes Mowing An Easy Job

No more hard to mow right-of-way for the Colorado & Southern Division of Burlington R.R. Thanks to the wide, gradually sloping berms, built with the Drott Bullclam Shovel, mowing with wheel equipment is now easy.

Grading berms is but one of the Drott Bullclam Shovel's many applications. It also picks up and disposes of front-end cinders, cleans and widens ditches, builds road grades for switch tracks . . . handles most any construction and maintenance.

Here is a unit worth investigating.

Get All The Facts! Write for this Book "Off the Rail Maintenance with the Drott Bullclam Shovel".

Drott Bullclam Shovel digs, carries or floats, dumps material. Shown in dumping position.

- **DROTT BULLCLAM SHOVEL FITS ALL MAKES AND CURRENT MODELS OF CRAWLER-TYPE TRACTORS, from 30 to 130 h.p. Four sizes, 1, 2, 3 and 4 yd. capacities.**
- **Operated by DROTT POSITIVE, CLOSED HYDRAULIC SYSTEM • SMOOTH • QUICK • DEPENDABLE. Keeps dirt and air out . . . keeps oil in! Used successfully on Drott equipment for many years.**

DROTT EQUIPMENT

HI-WAY SERVICE CORPORATION

Oliver

SCREW and DRIVE SPIKES

For Railroad Structures

The complete line of Oliver Railroad Fasteners includes Screw and Drive Spikes in a variety of styles and sizes as needed for railroad work. Some of these are illustrated below. Note the quality features that mean greater satisfaction—integral washers, clean threads, pilot-points, tough, high-strength material.

Oliver Hold-down Drive Spike
Timber Drive Spike
Timber Drive Spike with extended washer-head
The 10½" Oliver Timber Screw Spike
A representative style of smaller screw spikes
Typical head styles, Oliver Screw Spikes

OLIVER

Send for the Oliver Catalog of Railroad Fasteners.

SOUTH TENTH AND MURIEL STREETS · PITTSBURGH, PENNSYLVANIA

SEALTITE
RAILWAY PRODUCTS

SEALTITE HOOK BOLT | SEALTITE TIMBER BOLT | SEALTITE CAR BOLT | SEALTITE LAG SCREW | SEALTITE GUARD RAIL BOLT

Double-Life FINISH—Sealed in Zinc

SEALTITE WASHER NUT

LOKTITE NUT

LEWIS BOLT & NUT COMPANY, 504 Malcolm Ave. S.E., Minneapolis, Minn.

Serving 72% OF AMERICA'S CLASS I RAILWAYS

Fairmont Series

WITH A COMPLETE LINE OF MOTOR CARS

INSPECTION CARS

M9 Series E.....1-2 Men—Aluminum
M9 Series F.....1-2 Men—Aluminum
59 Series C.....1-2 Men
59 Series D.....1-2 Men
M19 Series D.....1-4 Men—Aluminum
M19 Series E.....1-4 Men—Aluminum

SECTION CARS

M14 Series E.....1-6 Men
M14 Series G.....1-6 Men
S2 Series E.....1-8 Men
S2 Series F.....1-8 Men
S2 Series G.....2-10 Men

GANG CARS

MEMBER 1945 NATIONAL RAILWAY APPLIANCES ASSN.

A3 Series C.....20 H.P.....4 Speeds Forward and Reverse
A5 Series C.....36 H.P.....4 Speeds Forward and Reverse
A6 Series C.....85 H.P.....4 Speeds Forward and Reverse

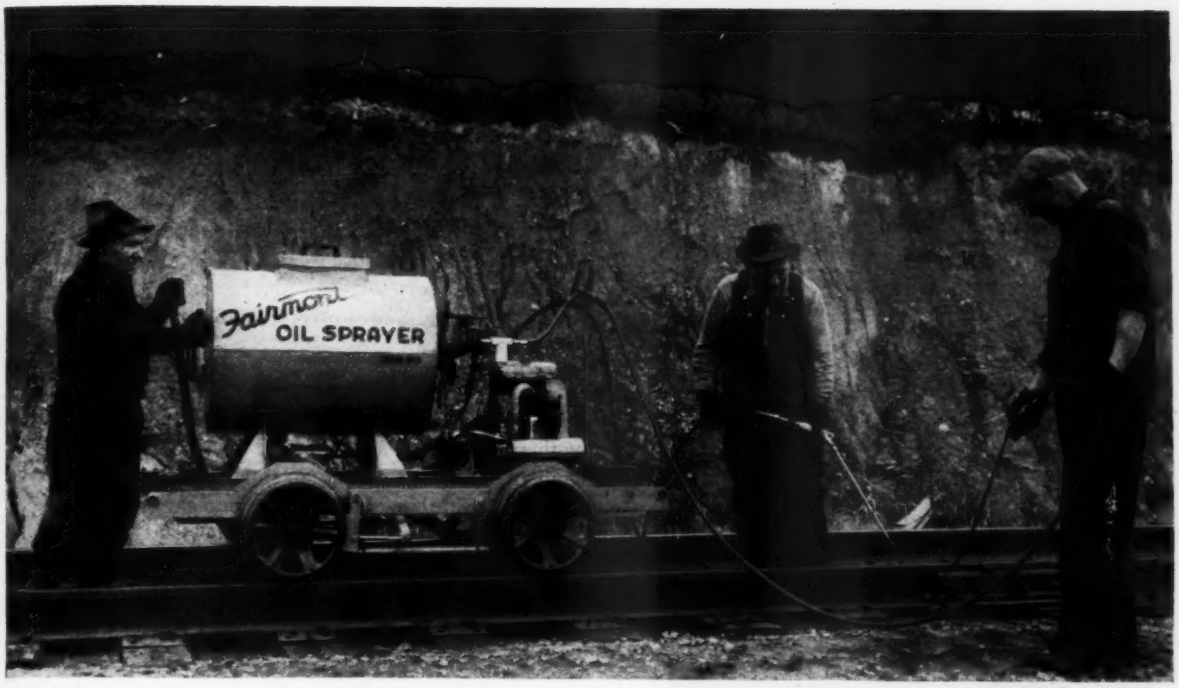
Write for Specifications and Complete Details

FAIRMONT RAILWAY MOTORS, INC. **FAIRMONT, MINNESOTA**

PERFORMANCE ON

The Railroads

WITH TIME AND LABOR SAVING WORK EQUIPMENT



OIL SPRAY CAR

W61 Series A—Pressure Oiling for Rail Joints, Switches, etc.

WEED BURNERS

W44 Series B.....Open Flame.....3 Nozzle
W55 Series A.....Open Flame.....5 Nozzle
M27 Series G.....Oven Type

EXTINGUISHER CARS

T27 Series C.....Tank and Pump
T28 Series A.....Tank only

BALLAST DRAINAGE CARS

M23 Series E....Ballast Drainage Power Unit
M25 Series D....Ballast Discer

WEED MOWERS

W54 Series D.....One Cutter Bar
M5 Series A.....Two Cutter Bars
M24 Series E.....Two Cutter Bars

DERRICK CAR

W60 Series A....Load Capacity 3000 Pounds

SPOT BOARD

High Speed Spot Board—Used With or Without Grade Stakes

MEMBER 1945 NATIONAL RAILWAY APPLIANCES ASSN.

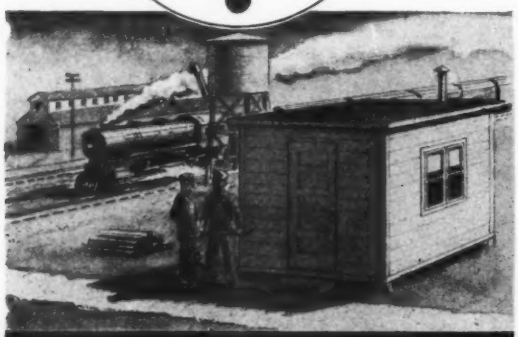
Write for Specifications and Complete Details

FAIRMONT RAILWAY MOTORS, INC. • FAIRMONT, MINNESOTA

Housing IN A MATTER OF Hours - NOT MONTHS!

That's TEXAS PRE-FAB's solution to railway housing problems. Housing when needed most urgently—*not* after it's too late. That's why you'll find hundreds of TEXAS PRE-FABs along lines like Santa Fe, Burlington, Southern Pacific, and Rock Island.

It will pay you to thoroughly investigate TEXAS PRE-FAB Housing. Following are brief descriptions of three types of TEXAS PRE-FABs for railroad use.



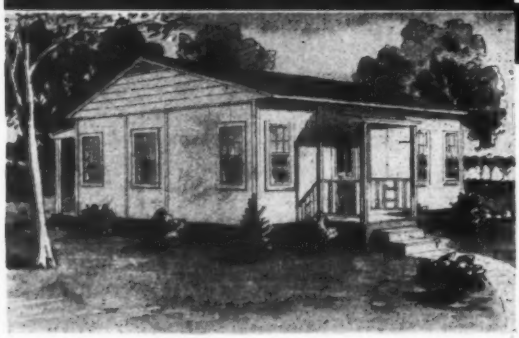
UTILITY BUILDINGS, 8' x 10'—ideal for watchmen's shanties, tool houses, handcar sheds, etc. Comes in 7 sections that two men can erect in a couple of hours. Just as easily demounted and moved to another locality. Has 1 door and 1 or more casement glass windows.

HOMETTES—Quick, comfortable residences for railway employees. Portability permits moving the house to follow the job. Also 16' x 16' TEXAS PRE-FAB Commercial Units of same basic design (in singles or multiples up to 96' long) provide bunk houses for section gangs . . . commissary quarters . . . community wash room and lavatory facilities . . . material storage rooms.

COTTAGE HOMES—Permanent, comfortable, low-cost dwellings erected in a fraction of the time required for conventional construction. A big step toward greater employee satisfaction and its resulting increase in employee productivity.

For detailed information, mail coupon below.
Or 'phone us if we can be of immediate service.

TEXAS PRE-FABRICATED HOUSING COMPANY
Avery and Beckley Sts. DALLAS 8, TEXAS Phone Riverside-4651

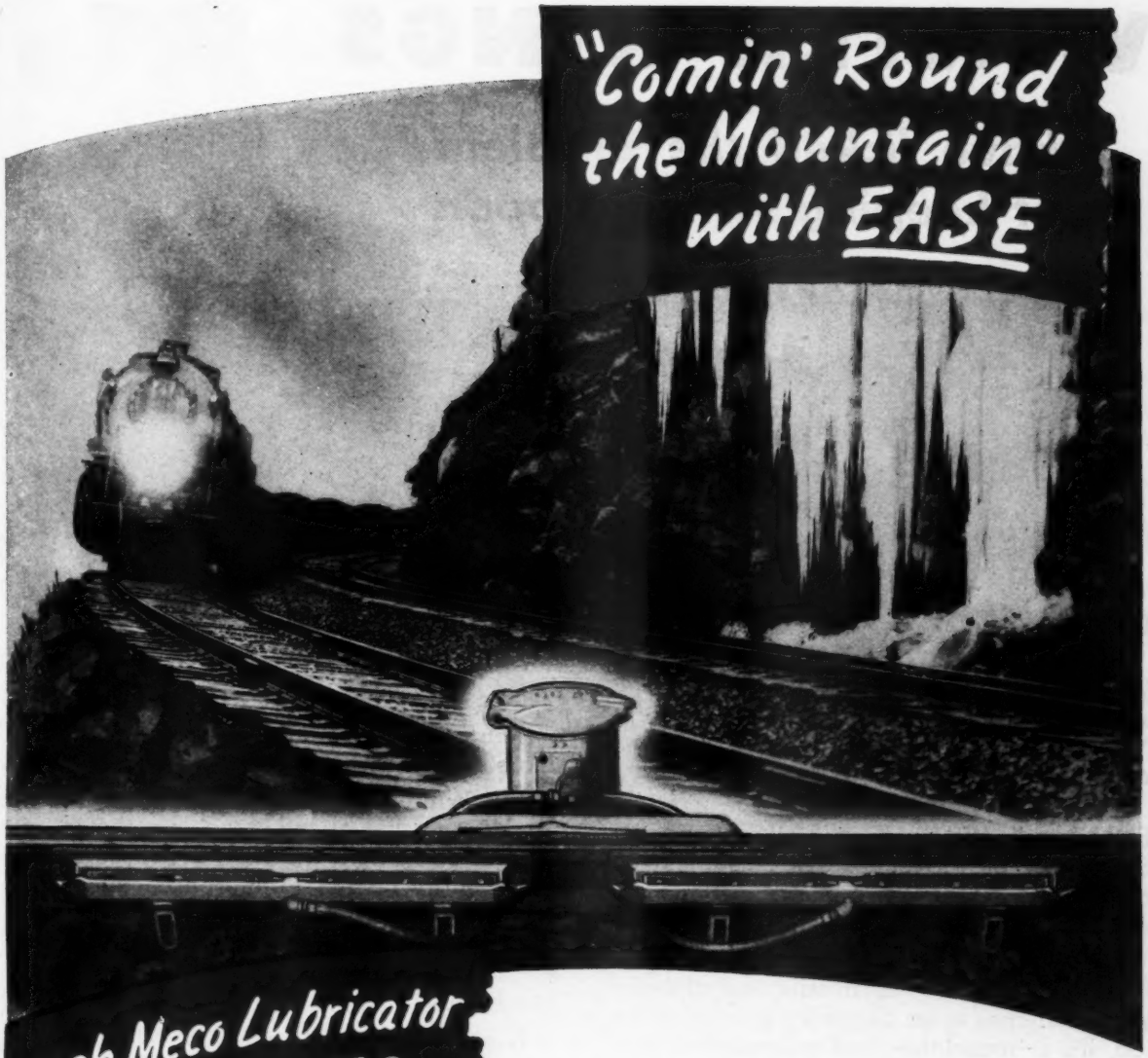


WRITE FOR PRICES AND SPECIFICATIONS

TEXAS PRE-FABRICATED HOUSING CO., Dept. F
Avery and Beckley Streets, Dallas 8, Texas

Please send full information, including prices and specifications on the following:
Utility Buildings ☐ Homettes and Commercial Units ☐ Cottage Homes ☐

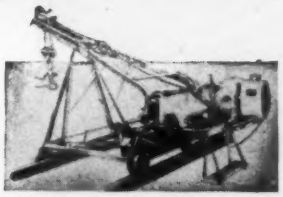
Name_____ Title_____
Company_____
Address_____
City_____ State_____



each Meco Lubricator PROTECTS A Number of Curves

MECOlubrication eases the tremendous friction of today's enormous tonnages against curves . . . prolongs remaining life of present curve rails 2 to 4 times . . . then when you re-lay rail, Meco remains on the job to double or quadruple the life of the new rails.

Maintenance Equipment Company
RAILWAY EXCHANGE BUILDING • CHICAGO, ILLINOIS



Power Rail Layer Requires No Train Orders

Mack Reversible Switch Point Protectors Make switch rails last 8 to 10 times longer

MEMBER 1945 NATIONAL RAILWAY APPLIANCES ASSN.

803

WINTER KINGS

have licked the problem of keeping switches open

1. Compact overall dimensions: 18 in. long, 4½ in. wide, 7½ in. high, including flanges.
2. Flanges at burner end protect ties from the flame.
3. Sliding cover facilitates heat regulation.
4. Fuel opening is protected by self-closing cap. Heater can safely be filled while flame is burning.

Bethlehem's Winter King Switch Heater is the ounce of prevention. But its value is greater than the biggest pound of cure you ever tried.

This simple, compact, and inexpensive heater fights snow as it falls and thereby keeps switches open. Since it's always on the job, it's a 'round-the-clock guardian of your switch points — eliminating freeze - ups far more effectively than manual methods.

The Winter King burns low-cost kerosene. Its 1½-gal. fuel chamber holds sufficient oil for 9 to 15 hours of burning, depending upon the severity of the storm. Four heaters to a side are usually recommended on 16½-ft. switches. The amount of heat can be regulated by a cover that slides easily over the combustion chamber.

If you haven't yet tried the Winter King, ask a Bethlehem man for full details. He'll be glad to show you why thousands of these economical heaters have proved so effective in New York, Philadelphia, Boston, Buffalo, Chicago, St. Louis, and other areas where Old Man Winter is an annual hazard.

Order your Winter Kings now for summer and early fall delivery—so you'll be ready for next year's early snowstorms.

Filling is so easy that one man can handle a large number of Winter Kings.

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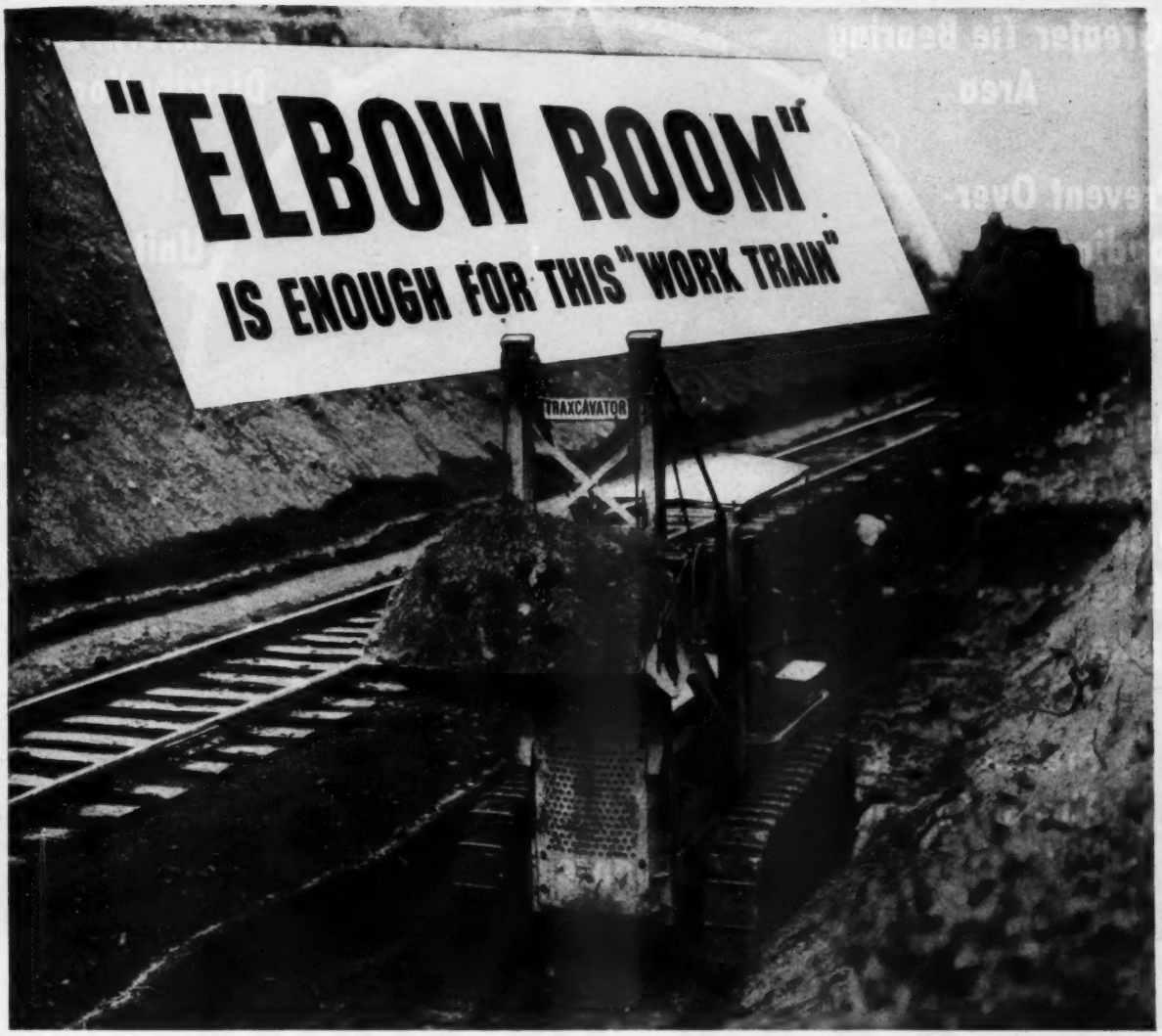

Scoop – lift – haul – dump is the routine of the "Caterpillar" Diesel Tractor equipped with a Traxcavator. Besides cleaning ditches, shoulders and clogged track area, it can slope and widen enbankments . . . straighten stream beds . . . fill around abutments and culverts . . . handle ballast . . . mix and spread . . . pile or load trash . . . remove snow. . . . All with typical "Caterpillar" Diesel economy and easy operation.

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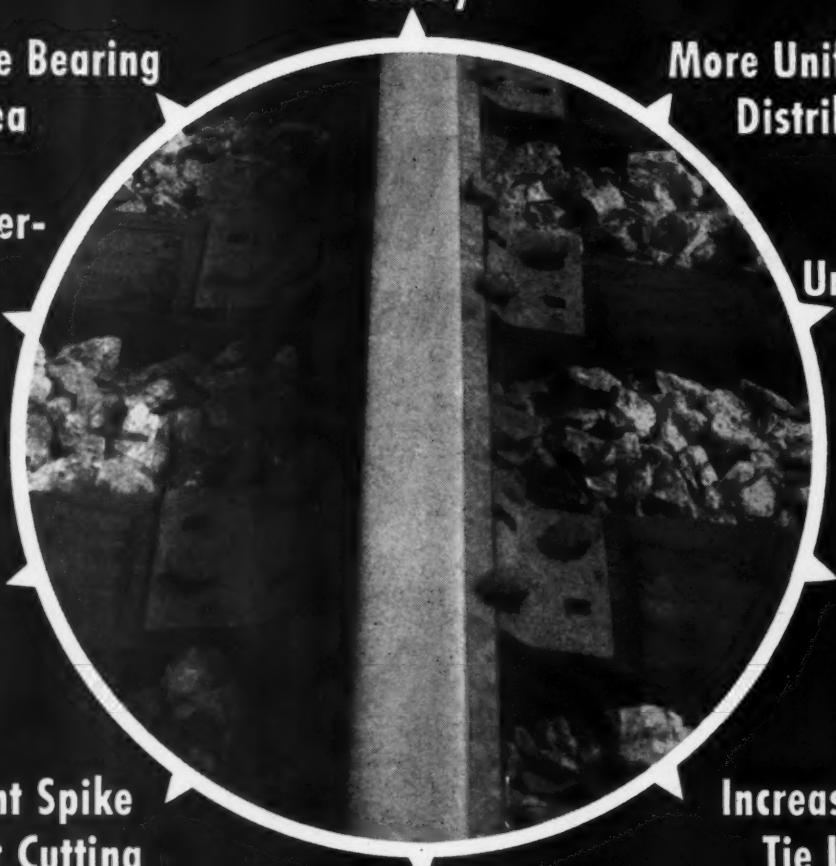

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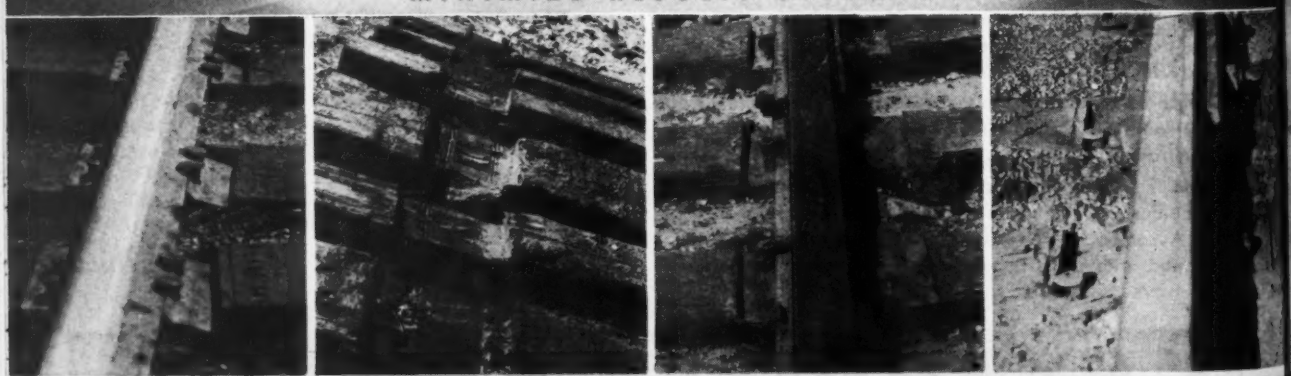

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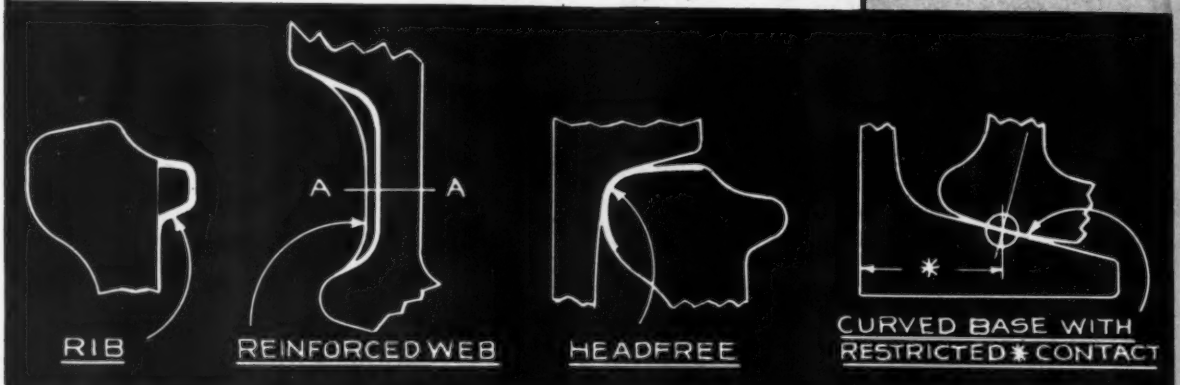

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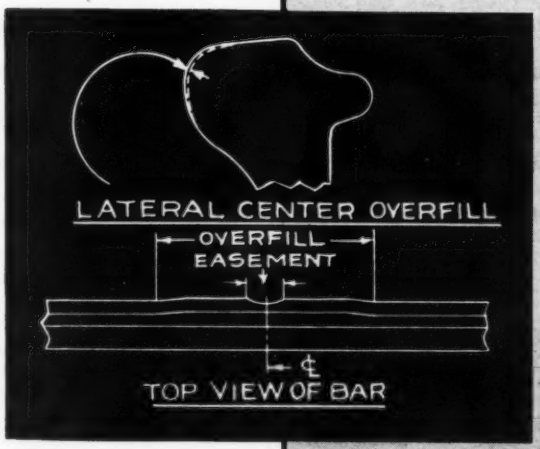

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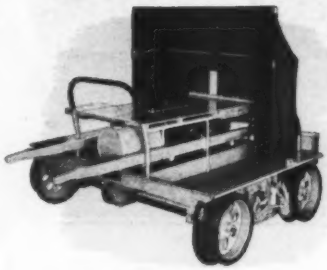

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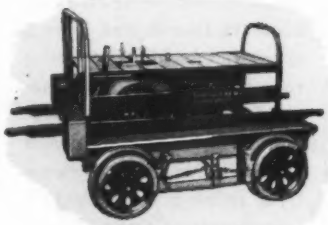

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No. 195 of a Series

Railway Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING CORPORATION

105 WEST ADAMS ST.
CHICAGO 3, ILL.

Subject: Help to You—Our Compensation

March 1, 1945

Dear Readers:

For the twenty-seventh consecutive year, the March issue of Railway Engineering and Maintenance is again devoted almost exclusively to the development, use and maintenance of power tools and machines designed specifically to help you in your work. Every effort has been made to make this issue of greatest value to you—and it has taken real effort—both on our part, and on the part of many of you. We hope that we have succeeded. If we have, that is compensation enough.

As a matter of fact, you may be interested to know the extent of the effort that goes into the editorial contents of an issue like this one—an issue containing 10 feature articles, all prepared specially, in addition to our What's The Answer section, a number of pages devoted to new and improved equipment developed during the year, and our regular editorial comment and news pages.

In the first place, it involved a large amount of traveling to contact you men to find out what you are doing and how you are doing it, including trips to St. Louis, Mo., Boston, Mass., St. Paul, Minn., Superior, Wis., and Washington, D. C.; it involved making arrangements with the more than 30 railway men whose views and experiences are brought to you in this issue; and it entailed the writing of more than 300 letters to railway officers and equipment manufacturers to permit compiling the information contained in the various staff-written articles.

Add to this the time and painstaking efforts on the part of the editors and the many contributors in writing and editing the articles themselves, andthe mechanical work involved in an endeavor to present all of this material in an interesting and attractive manner, and you have a general picture of what goes on behind the scenes in getting out just one issue of Maintenance for you.

Handicapped by time and paper limitations, this issue is not all that we would like it to be, because there is almost no limit to what we should like to do to be of service to you. At the sametime to the extent that this issue if of interest and help to you in carrying out your essential war jobs—keeping the fixed properties of the railways adequate to any demands—we are gratified, and feel that our efforts have been more than compensated for. We are particularly indebted to the many railway men who have contributed so substantially to the value of this issue, and we hope, most sincerely,that they, too, will sense a real feeling of compensation for the important part that they have played in this regard.

Sincerely,

Neal D. Howard

Editor

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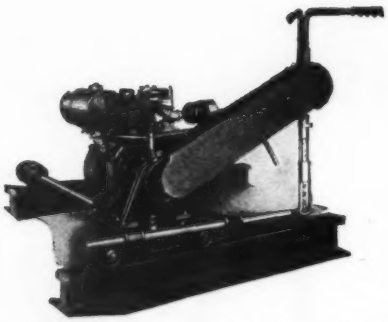

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MARCH, 1945

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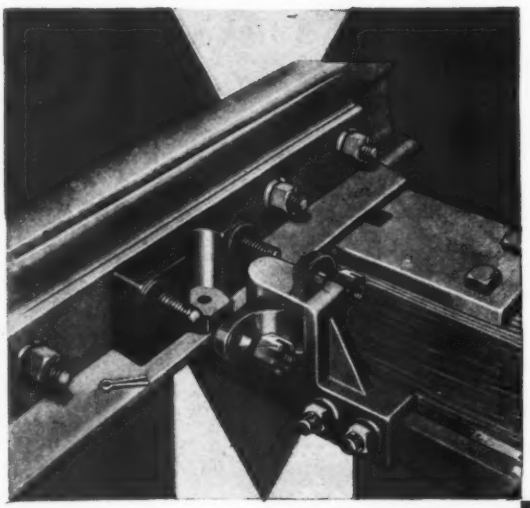

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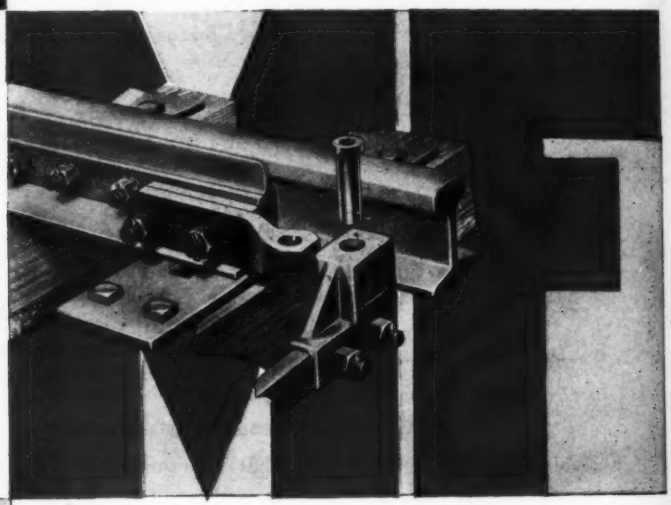

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Railway Engineering and Maintenance

The Outlook—

More Darkness Before the Dawn

Maintenance officers are not unaware of the drastic changes that have taken place on the various war fronts during recent months, and of the general consequences that can be expected therefrom, but they may well probe a bit deeper into the probable effects of these changes on the home front, and especially upon their immediate maintenance problems in the months ahead. Late last fall, there was a wave of over-optimism over the country as our fighting men swept across France, Belgium and Luxemburg to the borders of Germany, which was accompanied by a readily understandable, yet unfortunate, letdown on the home front.

Soon the war in Europe would be over—the end was in sight. True, it was recognized there was a war in the Pacific to be won, but, with Germany out of the way, that could be done with one arm, and large-scale military cut-backs and reconversion to peace-time production here would soon be the order of the day. It was a grand and glorious feeling, but high government officials, including many high-ranking Army and Navy officers, had misread the signs of the times and, by their utterances, had brought industry and civilians alike to the same faulty conclusions.

Last December on the Western front changed all this. Today, any attitude of overconfidence—of complacency—has disappeared; talk of cut-backs has been replaced by stepped-up war production schedules; concern about labor layoffs has been replaced by threats of the most drastic man-power controls in the history of the country; and the words "post-war" and "reconversion" have been shelved as new plans have been shoved to the forefront for an intensified drive on Germany, and an early all-out blow against Japan. These are momentous changes—changes that cannot help but affect every man (every railway man) and every industry (every railroad) in the country.

The extent to which these new factors will affect the railways and railway men is anyone's guess. There are those who depreciate as "scare propaganda" the new talk in government circles—a tendency now to over-emphasize the war problems to counteract earlier optimism. Those who so apprise the situation may well be correct, in part at least, but it is generally agreed that there was a slow-down on the home front, which had to be corrected.

In any event, in the face of unquestioned additional war needs, and the reported plans for immediate full pressure on Japan following victory in Europe, it seems a certainty that the impact on the home front will be substantial. Even discounted, these plans foreshadow no appreciable letdown, and possibly an increase, in traffic for the railways in the months ahead; they portend a continued, and possibly more severe, labor shortage in railroad personnel; and they forbode, unmistakeably, a tighteing of the present material situation.

Can the railways take it? They must take it—there can be no failure on their part. Their answer will be a resounding "all hail" to the military, the War Production Board and other government agencies in any new plans designed to speed victory on both war fronts. However, lest there be any misunderstanding or oversight, let it not be forgotten by these agencies that the railways—an aggregate of men, materials and machines, as much so as the Army, of which they are an essential and indispensable auxiliary—cannot be stripped of any of their essential components—men, materials or machines—and still do the job that will be expected of them. Surely, there can be no mistake or short-sightedness in this regard, but if there is, it is the first duty of railway men to see that it is corrected—and promptly.

Work Equipment—

Post-War Demand Should Be Strong

DURING the last three years of unprecedented and still peak traffic, some of the viewpoints of the maintenance forces have been undergoing changes. One of these has been the attitude toward the use of power machines and tools. However, much of the groundwork for the present attitude toward mechanization of the maintenance forces can be traced to experiences of the depression years, although this viewpoint did not gain full expression at that time, and it might even be said that it is still in the development stage.

Until the end of 1929, while certain roads had bought freely of the power machines and more sparingly of the power tools then available, many others were unable to see advantages in the mechanization of their forces, except for work that could not be done by manual methods alone. Not a few ranking maintenance officers, having bought a few machines and tools, considered that their forces were well equipped when, as a matter of fact, as has been shown by later developments, they had scarcely made a start toward mechanization, except with respect to motor cars.

Many lessons pertaining to the use of work equipment were learned during those lean years of the Thirties, when funds were not available to hire labor, which have been carried over into the present period of labor scarcity. It is true that the maintenance forces today, as a whole, are larger numerically than they were a decade ago. Relatively, however, the labor stringency is still greater than it was then, because of the difference in traffic volume, the marked increase in train speeds, and the difficulties that are being experienced in the procurement of materials necessary to maintain the roadway and structures in a safe condition to carry today's traffic.

With labor as scarce as it is at present, and is likely to be for some time, only through continued and intensive use of power equipment will it be possible to do many of the tasks that must be done if traffic is to be kept moving without interruption or delay. It has been under the pressure of necessity that maintenance officers have come to realize fully the advantages of mechanizing their forces. A lesson learned in this way is not soon forgotten. For this reason, the future holds promise that power equipment will come into as universal use for maintenance operations as motor cars are utilized for transporting the men that are engaged in these operations.

In giving consideration to this expansion in the use of power machines and tools in the post-war period, when restrictions on the use of materials have been lifted, the need for replacing existing equipment of this character should not be overlooked. When a power machine or a power tool is new, it possesses a certain potential service life, measured in hours of use, depending in part, however, on the character of the maintenance it receives. With few exceptions, both machines and tools have been used so intensively of late that much of this potential life has been exhausted and, by the close of the war, it may be expected that much of the existing equipment will be either ready for replacement or past the time when this should have been done, and numerous other units will be approaching this condition. For these reasons, the demand for power machines and power tools should be heavy during the next few years, particularly in view of the fact that a great deal of rehabilitation and improvement work will be a prime necessity for the railways.

Snow Storms—

Work Equipment Replaces Man-Power

MANY people in the United States were not fully aware of the serious transportation situation that developed this winter in the eastern Great Lakes region as the result of extremely severe weather conditions, involving record snows, high winds and low temperatures, extending over a period of several weeks. The fact is, however, that, embracing one of the most important transportation areas of the country, conditions became so serious as almost to constitute a crippling blow. That they did not completely paralyze transportation is a tribute to the resourcefulness and all-out efforts of the railroad men in the area affected. Credit must also be given, however, to the important part played by work equipment in meeting the frequently arising emergencies, because such equipment was the chief weapon used in combating the record weather conditions in many areas. In fact, in some instances, every available machine that could be adapted to snow-fighting service was pressed into service. Just what happened, especially in and about the Buffalo, N. Y., area, and the methods and machines used to keep yards and main lines open, and trains moving, is described and illustrated in an article that will be found elsewhere in this issue.

The severity of the traffic conditions that developed because of the extreme weather prevailing may be judged by the fact that the Office of Defense Transportation considered it necessary to authorize two restrictive embargos, one of three days' duration and the other of four days' duration, affecting freight moving to or within the stricken area. That the situation was critical may be deduced also from the fact that many cities and towns in the eastern part of the country were nearly out of fuel, and some were getting critically short of food. In addition, manufacturing, including steel production, dropped temporarily to approximately half of normal current production in some areas. These conditions were the result of many factors, including the first railroad embargo, which restricted shipments of fuel and food, and the nearly complete paralysis or breakdown of highway and local transportation agencies serving many of the towns and cities located in the weather-bound territory.

The breakdown of other agencies of transportation, while the railways managed to keep traffic flowing (although in reduced volume and on slower schedules), is typical of the dependability of the railways, which the public usually takes for granted during emergencies, whether they arise from floods, blizzards or other causes. This time, however, the stakes were higher, the importance of keeping traffic moving was greater, and the obstacles—unprecedented weather conditions without surplus man-power to draw on—were more se-

vere. Indeed, the country is fortunate that the railroads are manned by men of resourcefulness and determination—who do not rest until every obstacle to the movement of traffic has been overcome or removed. The railroads, on the other hand, are fortunate that, in their most recent emergency, they had, or were able to obtain, the large amount of work equipment needed to do the job successfully.

Power Tools—

Advantages Warrant Wider Use

RELUCTANCE to discard hand methods in favor of machine operation in maintenance was one of the outstanding characteristics of supervisory officers a quarter century ago, and this provided one of the most difficult obstacles to the early acceptance of power machines and tools. However, this attitude was not confined solely to supervisory officers, for not a few chief engineers and engineers maintenance of way were unable to see the advantages inherent in the mechanization of their forces. The experiences of the depression years brought a far greater recognition on the part of the track forces, and a partial recognition by the bridge and building forces, of the value of mechanization, because the urgent need to get more work done than was possible with the forces at their command, made the use of power machines and tools imperative.

It is recognized generally that this appreciation developed more slowly among the bridge and building forces than in the track organizations, although some of the more forward-looking bridge and building officers recognized quickly the benefits to be derived from the use of small power tools. At present, confronted with a labor situation that is more acute than at any time during the depression, no officer responsible for the upkeep of the track is now reluctant to employ power machines and tools for any operation for which they are fitted.

Yet, surprising as it may seem, there is still considerable residual reluctance among bridge and building men to go as far as practicable in the use of small portable power tools. This is a subject that warrants the most serious study on the part of maintenance officers, for every indication points to the probability that the present shortage in labor will continue to the end of the war and for some time after it ceases. It will, therefore, be to the best interest of the railways to use the power tools they now possess as intensively as possible to increase the output of the gangs they are working and to acquire as many more units as the present restrictions on procurement will permit. They need have no fear of passing the saturation point.

There is also a field for the larger units in bridge work that is only now beginning to show signs of development. This is in the use of off-track cranes for the handling of heavy timbers, steel members and other loads that are now usually handled by on-track machines. Properly equipped, these off-track units can also be used to excavate foundations, for unloading materials and for many other tasks that are continually arising on work of this character. The advantage of using such equipment lies in the fact that it requires no work train or the presence of train or enginemen, and that it can be kept busy on any job that is of sufficient magnitude to warrant its assignment.

Motor Car Series—

To Alternate With Water Service Articles

SINCE this issue is devoted almost exclusively to a consideration of the various phases of the mechanization of railway maintenance work, it is entirely fitting that it should be chosen to include the first installment of a series of articles on the care, selection and operation of track motor cars. This is especially true because the motor car not only constitutes one of the most important units of work equipment in use on the railroads today, but also because it holds the distinction of being the machine that brought about the first large-scale application of the internal combustion engine to maintenance of way and structures work.

Readers of *Railway Engineering and Maintenance* will recall that an earlier series of articles on motor cars was published in this magazine in 1930 and 1931. So favorably was this series received that it was later reprinted in the form of a booklet, of which hundreds of copies were sold. Because of the many advances in motor-car design and construction that have been introduced in the intervening years, and in consideration of repeated requests in recent years that the earlier series of articles be brought up to date and be republished, it was decided to arrange for the publication of a new and completely rewritten series that would present the subject in all its modern aspects. The new series is being written by G. R. Westcott, assistant engineer, Missouri Pacific, who is in charge of work equipment on this road and who is admirably qualified to handle the assignment.

In undertaking the series of articles on motor cars at this time we are mindful of the fact that we are now in the midst of a similar series of articles on the maintenance of water service facilities. In considering this aspect of the situation, it was felt that to publish articles of both series in each issue would have the effect of restricting the amount of space available for the discussion of current developments. At the same time, from the standpoint of our readers, practically all of whom are interested in motor cars, it was not considered desirable to hold up the motor car series until the water service series is finished. With these considerations in mind it was decided to run both series concurrently, but to publish them alternately in successive issues, so that each issue will contain an installment of only one of the two series. This explains why the current number does not contain an installment of the water service series.

This arrangement will permit us to keep both of these timely series running at the same time and, in addition, will allow ample space in each issue in which to discuss current activities in all branches of maintenance of way and structures work. We trust that our readers will extend their approval of the arrangement adopted.

More Than $14,000,000

Many Power Tamping Outfits Will Be Purchased This Year

MANY indications point to the probability that the railways will be called upon to handle more traffic in 1945 than in any previous year of the present conflict. Maj. Gen. C. P. Gross, chief of transportation, Army Service Forces, said recently that, regardless of the progress of the war in Europe, a tremendous freight movement will be needed to increase the flow of supplies to the Pacific, in addition to which there will be a vast flow of relief supplies to devastated European countries.

This is the prospect that confronts maintenance-of-way officers at the beginning of the fourth year of the most acute labor shortage in railway history. Even with a larger importation of Mexican Nationals, compared with 1944, which most of these officers hope for, the labor shortage in 1945 will still remain critical so far as maintenance requirements are concerned. Recognizing the situation as one that they must meet largely with their own resources, little outside help, these officers are again planning to purchase more power machines and power tools as the only solution of the labor problem—a problem which they foresee as continuing as long as war activities are maintained at their present level. To make matters worse, the difficult situation presented by an inadequate supply of labor has been complicated by unusual requirements for the maintenance of both track and structures, which have been imposed by the extraordinary traffic that is now moving, and by a general increase in train speeds.

No Complete Substitute

While maintenance officers have been well aware that there is no complete substitute for man-power in maintenance, they have learned, as never before, the value of work equipment as an offset to a considerable percentage of the man-power that is not now available. That this lesson has been driven home in recent years with greater emphasis than ever before, is demonstrated by the purchases of work equipment that have been made each year since the labor shortage first appeared. In other words, these officers have come to realize fully that unless they mechanize their forces to the limit, they will be unable to continue to maintain their tracks and structures in condition for handling the enormous traffic that is moving over them, a traffic which bids fair to continue at its present level for some time to come.

One strong contrast is found, however, in comparing the budgets for 1942, the first year of the labor stringency, with those for 1945. In the earlier budgets, most of the units to be purchased were intended for the replacement of older machines, many of which had been carried through the depression years when only a limited amount of money was available for new equipment, and less than the usual percentage of the purchases for that year were planned as additions. As a matter of fact, because of the unexpected reduction in the labor supply, most of the roads purchased a considerable number of units more than they had planned to purchase when the budgets were prepared. On the other hand, the budgets for 1945 of the roads that are represented in this study show a surprising unanimity in the fact that except for motor cars, all but a few of the units to be purchased this year are intended as additions to the equipment already owned. It was implied, where it was not stated directly, that the present policy is not to retire any unit that can be kept safe and effective for operation, regardless of the economics of this action.

In making the analysis upon which this article is based, a selected group of roads was asked what types and what number of units of work equipment they expect to purchase in 1945. Replies were received from 35 of these roads, representing more than 153,000 miles of lines, all but six of which gave details of their budgets. Of the latter, three stated that they do not work on the budget system, but purchase equipment as the need arises; two gave only the dollar value of their intended purchases; and one said that its 1945 purchases were expected to parallel, and possibly exceed those for 1944. Two other roads explained that they are not planning at present to buy any power machines or tools.

How Many Will They Buy?

On the basis of the information given, it is estimated that at present the railways are planning to purchase approximately 8,100 units of the heavier types during 1945. In arriving at this figure, the actual number of units included in the budgets of the roads participating in this study has been extended to include all roads in the United States and Canada. The same method has been followed in

for Work Equipment in 1945

Faced with a continuing acute shortage of labor, the railways contemplate the purchase of approximately 11,000 power units this year as an aid to maintenance

estimating the number of units of individual types which are discussed on following pages.

It should be kept in mind, however, that the foregoing figure includes relatively few of the small, portable, power-operated hand tools, used principally in bridge and building work, of which a substantial number are purchased every year, although they seldom appear in the budgets for work equipment. Neither does it include many portable tools, other than tie tampers, used by the track forces, nor certain other types that are seldom included in the budgets for power machines, but which are invariably purchased in considerable number as the year advances.

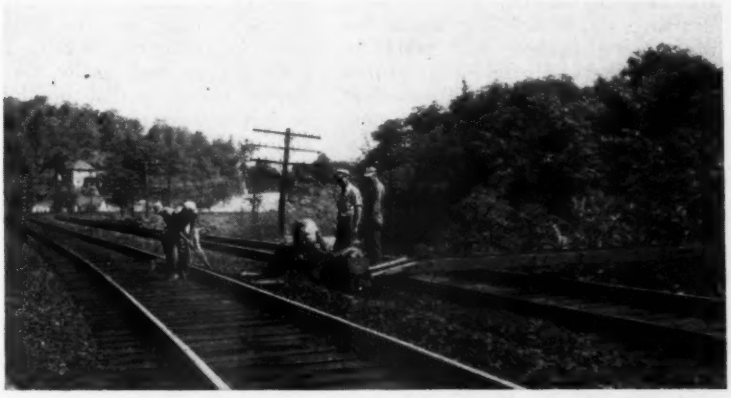
On the basis of the purchases of those types that have been made in previous years, and particularly of those made in 1944, it is safe to assume that not less than 1,500 such units will be purchased during 1945. Adding these to the units concerning which the information is more definite, the total number of units which the railways plan to purchase in 1945 is increased to 9,600, for which they will spend approximately $14,000,000.

Another feature of work equipment purchases that should be kept in mind is that the budget estimates invariably fall short of actual purchases. In fact, even after consideration is given to those items that seldom appear in the budgets, but that are purchased during the year, the actual purchases normally exceed the budgets from 30 to 50 per cent. There is no reason to believe that the purchases in 1945 will differ in this respect from those of former years, for which reason it can be assumed that the actual purchases for the year will exceed 11,000 units.

Obviously, a record of the total purchases of work equipment year by year is of value and interest to every maintenance of way officer, because it becomes not only a measure of the expanding use of this equipment and of the extent to which it is being employed in railway maintenance, but also discloses the current trends in the use of power machines and tools. To permit an analysis to be made of the trends for the year, the chief engineers and engineers maintenance of way who were solicited for information concerning their plans for the year, were also asked to give detailed information with respect to the number of units of each type of equipment that have been included in their budgets.

What the Budgets Disclose

In response to this request, 92 types were mentioned specifically, a larger number than has been included in the budgets for any previous year. This list included only a few of the small tools used in bridge and building work, however, so that the actual purchases will represent a much greater number of types. As the lists were given, however, they cover a wide range with respect to both size and types for an equally wide range of maintenance operations. They include a record amount of heavy grading equipment, including power shovels, carryalls, scrapers, draglines, ditchers, tractors and auxiliary attachments, locomotive cranes, ex-



Effective Track Maintenance Requires that the Ballast Be Kept Clean

Weed Destruction Is Essential to a High Standard of Roadway Maintenance

cavating buckets, spreader-ditchers; also a wide variety of machines incidental to laying rail and for its later maintenance, for ballasting and renewing ties; pile drivers, snow-fighting equipment, jackhammers, paving breakers, impact and other power wrenches, rail saws, wood saws and other portable wood working tools.

The foregoing list covers only a few of the 92 types that were mentioned, for these types also include concrete mixers, concrete vibrators, equipment for cleaning ballast, for providing drainage, for controlling weeds, for maintaining bridges and buildings, for cleaning and painting structures, for transporting men and materials, and for practically all other maintenance operations for which power machines and tools are available.

Equipment for Grouting the Roadbed Is in Greater Demand

Although the railways are dependent upon military necessity when it comes to supplying their equipment and material needs, the War Production Board has generally been as liberal as conditions permitted, although the allotments of rail have sometimes been pitifully small compared with requirements. If, however, as is hoped at this time, larger allocations for rail will be made for the year, this will, in itself, increase maintenance activities, not only so far as the laying of the rail is concerned, but with respect to many related items.

In preparation for laying this rail, despite the large number of such machines purchased during each of the last four years, the budgets for 1945 call for the purchase of 915 units to be employed in laying rail, some of which will also be used later in connection with rail maintenance. This is the largest number of such units to be budgeted in any year. These machines include tie adzers, bolt tighteners, spike pullers, spike drivers, rail cranes, rail-laying machines, rail and bonding drills, and surface and cross grinders.

Rail programs ramify far beyond the actual laying of the rail, for they are usually accompanied by ballasting programs of corresponding magnitude, and this calls for strengthening and reshaping the roadbed to insure the largest return on the expenditure for the rail and ballast. These improvements demand a stable roadbed which obviously cannot be maintained without adequate drainage, the need for which has been greatly emphasized by both the higher train speeds that characterize the movement of traffic today and the enormously increased traffic that is being handled currently; as well as by the fundamental necessity that nothing shall be left undone to insure dependable and uninterrupted service for military requirements.

As contemplated in the budgets, the amount of ballast to be applied will approximate that for 1944, although two or three roads are planning for a material increase, provided the labor situation will permit. With only a few exceptions, however, the plans for the year call for a relatively large increase in out-of-face surfacing without the application of additional ballast. It is also expected that the amount of routine surfacing will be increased.

Tie Tamper Needs

As an indication of the volume of this type of work that is planned, the current budgets provide for 408 tie-tamping outfits, both electric and pneumatic, and 258 unit tampers. This equipment ranges from self-contained unit tampers to complete outfits of 4 to 12 tools, although the 4-tool outfits greatly outnumber the larger units. In addition, a considerable number of individual tamping tools will be purchased to replace similar worn or obsolete tools.

Maintenance officers have come to look upon weed destruction as being in the same category with drainage, with respect to its necessity if high standards of track and roadbed maintenance are to be maintained. Neglect to keep the roadbed and ballast clear of weeds results in defective drainage and an increased expenditure of labor to maintain line and surface, while it necessitates frequent applications of ballast to overcome clogged drainage.

Furthermore, uncontrolled vegetation on the right of way not only presents an undesirable appearance, but creates a hazard of fires that may destroy structures and thereby delay or endanger traffic. Such fires are also prone to extend to adjacent property and destroy crops and farm buildings. To avoid these risks, the budgets for 1945 contain 223 weed-destroying units, including weed burners and on-track and off-track mowing machines of various designs. In addition, if weed-destroying chemicals become available in sufficient quantities, a number of roads are planning to make extensive use of chemical weed killers.

Trend Gathers Force

A trend that has been gathering force for several years, and which is considerably more in evidence this year than at any time previously, is the utilization of earth-moving equipment, of which 658 units are included in the budgets. This is not only the largest number of such units to be budgeted, but is almost double the number included in last year's budgets, which up to that time constituted the largest number contemplated for purchase in any year. For the present year these units include power shovels, draglines, cranes and excavating buckets, tractors and attachments, carryalls, scrapers, graders, road rollers, sheepsfoot rollers, spreader-ditchers, and other units, not one of which, except the spreaders, is rail mounted.

As has been explained, no close estimate of the number of small, readily-portable, power-operated hand tools to be purchased can be obtained from the budgets, since many of them make no reference to this class of tools, while others include only a few or refer to them as so many "sets of bridge and building tools" with power units. For this reason, any estimate for these tools must be based more largely on past purchases rather than on specific information gleaned from the budgets.

Basing the estimate partly on the purchases made in previous years, compared with the number of units budgeted at the beginning of the year

(Continued on page 261)

Great Northern
Emphasizes Field Repairs
in Equipment Maintenance

In the system employed on this road for maintaining and repairing work equipment a primary objective is to give the machines the necessary attention in the field to minimize the necessity of shopping them, either for making specific repairs or for overhauling. The advantages of the system, the details of the organization employed, and the manner in which it operates, are described in this article

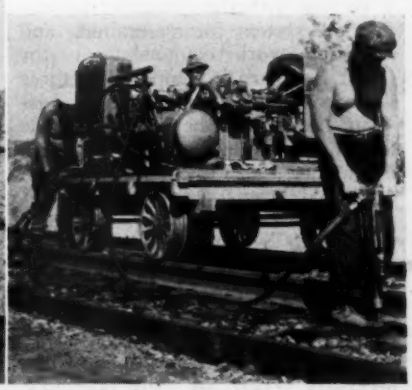
ADEQUATE attention in the field to the upkeep and operation of work equipment is considered on the Great Northern to be a fundamental principle in any plan designed to secure the maximum return on the investment in such equipment. That is why, in developing the system now in effect on this road for maintaining and repairing power machines employed by the maintenance department, primary emphasis was placed on the creation of a competent corps of field machine maintainers whose function is to see that the machines, through periodic inspections, necessary field repairs and proper training of the operators, are kept in good operating condition at all times and that the need for shopping them, either for specific repairs or for general overhauling, is minimized.

It is fully recognized on the Great Northern that a high degree of mechanization is a necessary requisite to efficient and economical maintenance of the tracks and structures, and consequently a wide variety of mechanized equipment has come into use on this road. Coincident to this development, it was also recognized that the most effective use of the equipment owned could not be obtained in the absence of an adequate system and organization for insuring that it would be kept in a proper state of repair at all times and that it would be operated by men adequately trained and qualified as operators. Also, in view of the number and variety of machines coming into use, it was felt that the organization developed to care for them should come under the jurisdiction of the maintenance of way department, although it was felt that the overhauling and making of heavy repairs to machines coming under MCB and ICC rules and regulations could best be performed by mechanical department forces which already had the necessary equipment and experience for doing such work.

Like Other Maintenance Operations on the Great Northern, Rail Laying Work Is Highly Mechanized

Few Seasonal Machines

While the need for centralized shops to make heavy repairs and to do overhauling work was recognized, it was felt that the most economical and effective set-up would be one in which the attention given to the equipment in the field would be such as to minimize the need for shopping the machines, either for making specific repairs or for overhauling them. Generally speaking, it was desired to avoid the practice of shop-



ping equipment periodically for the purpose of overhauling it. The practice of sending machines to the shop periodically presupposes a situation in which much of the equipment in use is employed only seasonally and can be released for overhauling at the end of the season. On the Great Northern, however, there are very few machines in use that are employed only seasonally, the majority of them being in operation more or less the year around. There are a number of reasons for this state of affairs. One of them is that new or different uses have been found for many machines originally designed for a single purpose, with the result that they are kept in service a greater percentage of the time. Another reason is that on some parts of the system operating conditions require that certain major items of maintenance work, such as the laying of rail, be performed during the winter months.

These various factors pointed to the desirability of developing a system of equipment maintenance under which, through adequate attention in the field, the machines could be kept in operation a maximum amount of the time and the need for sending them to the shops for overhauling would be minimized. In other words, whenever a machine is sent to a shop a certain amount of productive time is lost, depending on the length of the haul required and the nature of the repairs, and for this reason it was considered desirable to employ a system under which machines would be sent to the shop for overhauling only at infrequent and irregular intervals and then only when there was an actual need for the shopping as determined by inspection and observation of the machine in operation. Some few machines, of course, are strictly seasonal in nature and these can readily be sent in for checking and overhauling at the end of the season.

Three Components

In line with the foregoing reasoning, the system for maintaining and repairing work equipment on the Great Northern is composed of three main components, namely, (1) adequate attention to the machines in the field by means of traveling machine maintainers; (2) the use of a well-organized system for selecting and training machine operators to insure that work equipment will receive proper care from day to day; and (3) the maintenance of a series of centralized work equipment repair shops where the machines may be overhauled and heavy repairs made when necessary. There are eight operating divisions on this road and each of them has its own work equipment repair organization, including a central shop (completely equipped with necessary machines and tools and staffed by a foreman and the required number of mechanics and helpers), and a field machine maintainer who reports to the shop foreman.

Obviously, the field machine maintainer is a key man in each divisional organization, for it is his responsibility to keep under observation through periodic inspections all the machines under his jurisdiction, to make such adjustments and repairs as he may find necessary, and to assist in the selection and training of the machine operators. In carrying out these duties it is necessary that the field maintainers have complete freedom of movement and that they carry with them a variety of tools, machines and parts, and to this end each of them is supplied with a light enclosed highway truck. Each of these is equipped with a work bench and vise, a complete set of hand tools, and a variety of other tools and equipment needed in making mechanical repairs, such as a valve grinder, a wheel puller, a small chain hoist, a power drill, an impact wrench, a motor-operated hydraulic jack, and oxy-acetylene cutting and welding torches. In addition, it is the practice for each field maintainer to carry with him a small supply of the replacement parts that are apt to be needed most frequently, such as belts, bearings, spark plugs, distributor points, condensers, and motor car coils and magnetos.

Machine Operators Are Carefully Trained and Supervised

Duties of Field Man

Generally speaking, each field maintainer inspects all the machines under his jurisdiction at least once a month and sometimes twice a month, the frequency of inspection varying somewhat according to the maintainer's knowledge of the particular machine and the competence of the operator in charge of it. During these inspections, the maintainer observes the machine in operation and may even operate it himself, noting any irregularities that may require attention and making any necessary adjustments or minor repairs. If a part is needed that the maintainer does not have with him a note is made to pick it up on his next visit to the shop or to make a requisition for it if it is not carried in stock at the shop. Thus it is possible to anticipate the need for replacement parts and to make requisitions for them some time in advance of the actual need, this being a consideration of particular importance in these days when delays are frequently encountered in obtaining spare parts and when, as a consequence, it might otherwise be necessary to permit the machine to lie idle while waiting for a necessary replacement part to arrive.

Installing Spare Parts

Frequently a maintainer will carry in his truck a spare part that he has obtained to meet an anticipated need on a particular machine, and which he plans to install on his next visit to that machine. Or it may happen that the machine in question is engaged on a particular job and it is desired to wait until the job is finished before the part is installed. Again, the maintainer may carry with him a replacement part for a machine that is about ready for a general overhauling but which it is desired to keep in operation until the particular job on which it is engaged is completed.

At the end of each month the field maintainer makes a report on each machine under his jurisdiction, giving its location and describing its condition. To assist the field man in locating the various machines when making his rounds he is kept posted as to their whereabouts by the division roadmaster. Frequently when a considerable amount of equipment has been concentrated in one place, such as on a large rail-laying job, the field maintainer is asked to be present while the job is under way so that he will be immediately available to handle any repairs that may become

necessary, thereby avoiding possible delays to the work.

When the general condition of a machine reaches a point where it is no longer economical to keep it in operation, arrangements are made to send it to the division repair shop for a general overhauling. However, the exact date on which a particular machine is sent to the shop depends on a number of factors. For instance, it may be desired to keep it in operation until the job on which it is engaged is completed. Also, consideration must be given to the situation at the shop and its ability to handle the particular machine. As already indicated, a few highly specialized machines, such, for instance, as ballast scarifiers, are generally sent to the shop for inspection and overhauling at the end of each working season, but the majority of the machines in use on this road, being largely in service for one purpose or another the year around, are sent to the shop for overhauling only when there is a demonstrated need for doing so.

Training of Operators

It has already been noted that the Great Northern exercises particular care in the selection and training of machine operators to insure that its machines will receive proper and adequate attention from day to day. On this road, maintenance of way machines are divided into four groups according to size, and any qualified operator for a particular group can bid in as an operator for any machine in that group. In selecting machine operators, mechanically-inclined young men in the various gangs are encouraged by the field machine maintainer and the gang foremen to take an interest in the machines in use and to familiarize themselves with their care and operation. Eventually, if the worker shows sufficient promise and can qualify for the job, he is permitted to bid in as an operator for a small machine. As an operator he is observed closely by the roadmaster and the field maintainer and, as opportunity affords, he is given additional instruction in the care and operation of his machine.

Operator Helps Maintainer

One way in which the operator gains knowledge is to serve as a helper when the field maintainer is making repairs to his machine. Also, it is customary, when a machine is sent to the shop for overhauling, to send the operator along with it. As the worker gains more knowledge in machine operation he is permitted to "graduate" from one group of machines to the next higher group.

As an indication of the magnitude of the problem involved in keeping maintenance of way work equipment in operating condition on the Great Northern it may be interesting to list the number and types of equipment in use on a single division. The figures given are for the Mesabi division which, with headquarters at Superior, Wisconsin, embodies a total of 1,055 miles of tracks of all types, including 617 miles of main lines, 92 miles of secondary main lines, and 178 miles of branch lines. The equipment in use by the track department alone on this division includes 2 power ballasters; 2 power jacks; 12 four-tool pneumatic spot-tamping outfits; 2 eight-tool pneumatic tamping outfits; 8 electric four-tool spot-tamping outfits; 2 rail-laying cranes; 5 crawler tractors, all equipped with carryalls; 2 portable gas-electric generating outfits for emergency lighting purposes; 6 crawler excavators and cranes of various types; 2 spreaders; 1 combination rail and highway crane; 95 motor cars of all types; 12 automobile trucks ranging from ½ ton to 2½ tons in capacity; 4 power drills; 6 pneumatic spike drivers; 1 power-driven rail saw; 4 rail-grinding machines; 1 wheel-mounted weed mower; 2 mechanical spike pullers; 8 tie cutters; two power tie adzers; 6 power-driven brush cutters; 2 bit grinders; 3 weed burners; 2 creosote heaters; 1 joint oiler; 5 power track wrenches; and 1 tie scoring machine. Not included in this list are a considerable number of power-driven tools and machines assigned to the bridge and building forces, which must also be kept in condition by the equipment maintenance organization.

Benefits of System

Opinion on the Great Northern is that the system described in this article for maintaining and repairing work equipment, and training machine operators, is enabling the road to obtain the maximum return from its investment in such equipment. The system, it believes, is proving especially advantageous under the conditions that prevail today, which, requiring that work equipment be used more intensively than ever before, have, at the same time, confronted the roads with a shortage of manpower from which to select competent machine operators. On the one hand, the emphasis that is placed on making repairs to the machines in the field insures that lost time due to breakdowns and shoppings—and consequent disruption of work programs—is reduced to a minimum. On the other, the careful training of operators and the close supervision to which they are subjected by the field maintainers, constitutes insurance that the machines will receive the proper attention by their operators, even under present conditions.

The maintenance and repair of work equipment on the Great Northern is under the general supervision of L. J. Gilmore, general roadmaster, Lines west, and R. S. Kniffen, general roadmaster, Lines east, with direct supervision over the work being exercised by the division and district roadmasters.

$14,000,000 for Work Equipment

(Continued from page 258)

and partly on information gleaned from the current budgets, it is concluded that approximately 1,500 of these portable tools will be purchased during the year. This conclusion is strengthened by the fact that the budgets include 156 air compressors and 68 generators, a total of 224 units, which are in addition to those included in the tie-tamping, welding and paint-spraying outfits that are incorporated in the budgets. This is also the largest number of power plants ever to be budgeted, exceeding those for 1944 by 34 units.

What Are the Prospects?

Will the railways be able to obtain the amount of equipment they desire to purchase? With the tightening of the allocations for critical materials as a result of the greater expenditure of munitions and equipment than was expected on the fighting fronts, not a few officers expressed some concern about the procurement of the machines for which they have such vital need. Heretofore, however, the War Production Board has recognized the critical need of the railways for power machines to offset, so far as this is possible, the inadequacy of their forces, as the calls for man-power in other fields have become more insistent. There is no reason to believe that the WPB will be less understanding at this time or less inclined to be helpful in this field, than in the past, although, as pointed out in another article in this issue, the Transportation Equipment Division of the Board, visualizing increased military requirements for both materials and equipment, is not as optimistic about being able to supply the needs of the railways as it was at this time last year.

OPERATORS—

Power Tools and Machines Can Be No Better Than The Men Who Operate And Maintain Them

Train Mechanically-Minded Men From Among Regular Track Forces

By G. M. O'Rourke

Assistant Engineer M. of W.,
Illinois Central System, Chicago

THE need for work equipment operators on the Illinois Central System is the same as that for trained men in other occupations requiring special skills. Due to the critical man-power shortage on the Chicago terminal, work equipment operators have been doubling over from one type of machine to another. Here and elsewhere on the railroad, even though we have lost many qualified men to the armed forces, we have been able to continue the use of work equipment with men taught by other operators, division equipment repairmen and supervisors of work equipment.

Our methods to secure operators follow no set rule and are about the same all over the railroad. The novice is recruited from motor car or equipment repair shops, bridge and building or water service gangs, or from section or extra gangs, and sometimes new men are employed to operate particular machines who have had experience in running them elsewhere. Oilers or helpers on large machines are trained by the operators of these machines for relief duty. In agricultural communities it is not difficult to find men familiar with tractor operation, and they stoon become proficient with bulldozers and front-end loaders. Our supervisors and foremen are on the alert for the mechanically-inclined laborer who is ambitious to better himself.

Special Instruction

Our new operators are instructed or trained through the guidance of qualified machine operators and through detailed instructions given by repairmen, foremen and supervisors. Before actual instruction begins, the new man has explained to him just what is expected of him; where the machine is to be operated; what the living conditions will be, etc. As he progresses with the handling of the machine, he is provided with books of instructions and is encouraged to assist in making repairs of the machine so that he will know what makes it "tick".

In selecting prospective operators for on-track machines, it is desirable to develop men who have worked on the track and who are familiar with the movement of trains. Selection should be made from those demonstrating resourcefulness and good judgment. Safety must be uppermost in their minds. They should be required to attend safety meetings and should be given every opportunity of learning the safe way to operate the machine in their charge. Likewise, the regrettable results of not being safety minded should be stressed with them.

Special measures adopted to keep machines in service under the handicap of less skilled operators include the assignment to mechanized rail laying gangs of an experienced equipment repairman, and the modernizing of division roadway equipment repair shops where machines can be overhauled during the winter months and can be given running repairs during the working season.

Methods Are Effective

Examples of the effectiveness of the foregoing measures are seen in our success in breaking in the average trackman, both white and colored, to operate power wrenches, adzers, spike pullers, power drills, power tampers, discers and mowing machines; in the development of a first-rate rail laying crane operator, by having him accompany an experienced operator who allowed him to run the machine occasionally when slow operation would not interfere with the work, taking two months to break him in and make him feel confident that he could do good work; and in the making of electric welding machine operators from grinding machine helpers,

How Fill the Need? Offset Effects of Shortages?

Four maintenance men contribute of their experience in seeking a solution of this vexing problem

How to overcome the shortage in capable work equipment operators is one of the most difficult problems confronting maintenance officers. Without operators, roadway machines are useless, and may well be a liability. Some maintenance officers have been more successful than others in developing or adopting means looking to the solution of this problem; still others are groping for answers. However successful one's efforts to date, the many practical suggestions contained in this symposium should be of real value.

Past Practices Must Be Revised

By C. H. R. Howe
Cost Engineer, C. & O., Richmond, Va.

THE responsibility for obtaining a fair return on the vast investment of the American railways in power equipment must receive the careful consideration of all officers under whose direction work is undertaken. Maximum use of this equipment should be the constant goal. This introduces many corollary factors: Planning, programming, operation, inspection, field repairs, periodic overhauling, etc. It follows that intensified use will require more extensive repairs; also, that the person most closely related to the use of a given machine is its operator. It is difficult, therefore, to overemphasize the importance of the operator and his effect upon production, repair and upkeep.

In normal times the selection of machine operators was relatively simple: the primary qualifications, apart from mental, physical and moral attributes, were natural mechanical aptitude, orderliness about machinery, and ingenuity. The first of these qualifications is practically indispensable. Orderliness provides a very good indication of the service that may be expected from the man and the equipment in his charge. Ingenuity may perhaps better be defined as the faculty of adaptation in emergencies.

Comb Property

The widespread use of automobiles, trucks and tractors has resulted in a far more general knowledge of the fundamental principles of machine construction and operation than was formerly the case. At this time, however, the situation is far from normal. The need for satisfactory machine operators was never greater, and this is true largely of maintainers, also. The latter were usually selected from the ranks of operators, but now those eligible in the ranks are near depletion. In general, though, the situation as it relates to our railroad, apparently, is not as critical as that prevailing over the country generally.

On this property, the ranks have been combed to provide machine operators. Effort has been made to improve working conditions, and also living conditions, for those quartered in camp cars, although a dearth of the latter facilities, owing to war-time demands on revenue cars, offers little field for further improvement at this time. Our practice is to select the most promising men from the ranks, place them with experienced machine operators for a short time, after which, if training and development are satisfactory, to give them charge of the machines. While this method has certain disadvantages, it has provided a means of keeping work programs going with some degree of consistency. At best, however, present conditions require that work programs, schedules and personnel be revised and improvised too frequently.

With the uncertainty attending the delivery of many tools and almost all machine repair parts, some deviation from past practice has been found desirable and necessary, particularly as regards the stock carried by system or

grinder operators and welder helpers.

We have been as successful in our training efforts as we could have expected under the man-power situation that has confronted us. Only occasionally has it been necessary to disqualify a man in training and very few men have been found unsuited for the task assigned them at the completion of their training.

A highly commendable job has been done by the maintenance of way forces of the railways during the present emergency. However, it is not enough to say that we have accomplished a good, or even a remarkable, showing in the past. We are now entering a critical phase of the war—so critical indeed, that we must be constantly on the alert for opportunities to improve our operations.

An important question always aligned closely with tasks of the magnitude confronting railroad maintenance men is how they can be done more simply, faster and better—that is, more efficiently. In addition, it behooves all of us to do our jobs more economically. Greater emphasis is being placed constantly on the dollar cost of various work operations, and such costs can be reduced only by gathering in all of the loose ends and by greater attention to detail.

floating track forces for field repairs to those machines subject to most intensive use. This is indicated by the urgency for as nearly uninterrupted service as possible. Under the most favorable of present-day conditions, there are too many breakdowns or repair jobs of such magnitude as to require that machines be sent to a central reclamation or repair shop.

Not to be discounted among the problems surrounding the operation of mechanical equipment during this period is the need for adequate supervision of both men and machines. Variable factors, including the human equation, the extent to which knowledge is absorbed during a brief training period, possible lack of familiarity by operators with all features of the manufacturer's or the railway company's manual of instructions, the occasional need in emergency to adapt or improvise, and considerations of safety, all contribute to the necessity for adequate supervision.

Partial Answer in More Assistant Operators and Repairmen

By R. B. Chapman

Supervisor Work Equip. and Welding,
Southern Pacific, Pacific Lines,
San Francisco, Cal.

LIKE other railroads, the Southern Pacific Company—Pacific Lines has lost many experienced machine and power tool operators to the armed services and to war industries. Being situated in the West Coast's strategic war manufacturing and embarkation areas, the Southern Pacific has been called upon to construct tracks serving many war plants, to expand terminal facilities, to extend passing tracks, to lay many miles of new rail, and to increase track welding forces to handle the increased volume of traffic. The construction of new tracks and the daylighting of tunnels, the latter because of impaired clearances, has created large earth-moving projects.

To meet the numerous and widespread equipment needs for these classes of work, many additional units of work equipment were acquired for use by our roadway forces, and this has raised the serious problem of securing sufficient capable equipment operators. War activities in California and Oregon have made it difficult to obtain man-power replacements in these states. However, with company employment bureaus under each division superintendent, as well as in all larger Coast cities on our lines, the situation has been alleviated somewhat. In the Southwestern states of Arizona and New Mexico, we have had better success in hiring men, which is due probably to the fact that there are fewer war plants there.

More Repairmen

During this emergency, our roadway equipment, such as cranes, adzers, bolt machines, spike pullers, grinders, etc., has suffered most for want of regular operators. In many cases it is now necessary to assign helpers from the gangs using the equipment to operate it, and since these men are inexperienced, this means a breaking-in period, during which a machine is ordinarily subjected to rough treatment.

We rely on the division traveling motor car repairmen to assist the operators with running repairs, as well as to instruct new operators. Fortunately, also, many of our gang foremen are somewhat experienced in the use and operation of many of our machines, and they are lending all possible assistance. It has been necessary, however, to increase the number of motor car repairmen to help with this work.

Uses Trucks

To assist repairmen in the event of a serious breakdown, our system work equipment shop has been equipped with two panel-type trucks, each fully outfitted with tools and welding equipment. These are driven by regular system shop mechanics to any serious machine failures within a reasonable distance of our system repair shop, and they are usually sent as the result of telephone conversations between field men and the shop foreman. Thus, it is nearly always possible for the driver-mechanic to take along the parts required to make the repairs.

Unfortunately, very few equipment manufacturers carry a supply of parts on the Pacific coast and, as a result, we are sometimes delayed in getting failed machines back into operation. Most of these parts must come from the Middle West or the Eastern states.

The heavier classes of equipment, such as tractors and shovels, have not suffered quite as much for want of experienced operators. Operator rosters for these machines have for the most part been comprised of older men with many years of service, their experience in many instances dating back to the early days of power work equipment.

Train Helpers

We have always endeavored to bring into our organization men who have had gas engine, construction or farm-equipment experience. For instance, men who have had farm tractor experience soon learn railroad methods and procedure, and are able to operate tractors on our heavy grading projects.

When men are again available, we plan to assign helpers to a certain number of our machines. Assisting in the care of tractors, becoming accus-

Women Have Been Employed Effectively As Truck Operators On A Number of Roads, Relieving Men For Heavier Operations

tomed to railroad procedure, and practice machine operation, will all help develop operators for second-shift work or for assignment when vacancies occur. This practice has proved successful in the case of shovel and ditcher operators. Each machine has an assigned helper or fireman. Men hired as helpers are promoted to the position of firemen, and then to the position of engineer as vacancies permit. This is their opportunity for training, and if they qualify, they are accepted for the higher-rated positions.

When the larger units of equipment are brought to the shop for repairs, and opportunity permits, the crews, or at least parts of the crews, are brought to the shop with the equipment. This procedure not only proves valuable in that the shop forces are afforded first-hand information regarding the condition of the machines, but it also gives the operators the opportunity to see, first hand, hidden parts of the machines, and to see that proper adjustments are made before the machines leave the shop. Undoubtedly, this procedure has prevented many on-line failures.

During the most critical period of man-power shortage on our lines, the wives of several of our equipment operators helped out by taking jobs as truck drivers. Their help was very satisfactory and, without it, our work might have been delayed.

Mechanics Best Qualified To Train Machine Operators

By F. F. Zavatkay

Supervisor of Work Equipment,
New York, New Haven & Hartford,
New Haven, Conn.

THE TREND toward heavier trains moving at faster speeds that has prevailed during the past several years has required the railroads to rebuild their track structures accordingly. These improvements have necessitated the development and purchase of work equipment of various kinds to perform work which heretofore had been accomplished in a large measure by hand or with equipment entirely inadequate and uneconomical to meet the demands of modern maintenance work.

Of necessity such equipment was acquired in considerable numbers, and for the most part employees of the maintenance department had to be instructed or trained in its care and operation. As a consequence selected men were required for the operation of highway vehicles, track motor cars, locomotive cranes, ditchers, rail loading machines, sand conveyors, tie-tamper compressors, gas-engine-powered generators, bulldozer tractors, tractor snow plows and snow brooms, Jordan spreaders, pile drivers, ballast cleaning machines, power track jacks, power track wrenches, power rail drill machines, adzing machines and many other mechanized machines.

Supervisors responsible for the maintenance work to be performed are aided in securing replacement help suitable for operators through procedures of the War Manpower Commission. However, such aids do not provide all the help needed, and consequently special effort is made to encourage employees, heretofore not considered as good material, to become familiar with work equipment and to qualify as operators. New employees or those showing the aptitude and desire to become operators are assigned as assistants under qualified operators or work equipment mechanics, who teach the beginner by demonstration and instruction until he is considered competent in the care and operation of the particular machine and able to comply with rules and regulations for the safe operation of the equipment. In some instances groups of employees are selected and sent to the work equipment repair shop where they are given the opportunity to obtain instruction in methods of maintaining equipment, as well as to demonstrate their ability to qualify as machine operators.

To insure against failure to complete scheduled work programs requiring large gangs of men with full complements of equipment, work equipment mechanics with spare parts and supplies are detailed to check and make repairs to the equipment the day before each gang is scheduled to start work. Also, these mechanics remain on the job during the entire program, maintaining the equipment and instructing the less skilled operators.

The various supervisors and foremen are at liberty to call upon the work equipment department at any time for service to the equipment and for instructing the operators of any of the various machines. In certain special instances the work equipment department is called upon to supply operators where time does not permit the selection and qualification of operators—for instance, those required for the operation of spray car equipment used in oiling the roadbed and track fastenings.

The mechanics in the work equipment department gain their qualifications through experience in overhauling equipment in the shop and maintaining it under actual service conditions; therefore, they are best qualified to impart the "know-how" to other employees. These mechanics also have opportunities to obtain the benefits of contacts with factory service representatives of the various equipment manufacturers. At least one work equipment mechanic is headquartered at each important terminal point on the system, and these are supplemented, as occasion arises, with mechanics from the work equipment shop.

Our experience has been that operators that receive their training on railroad equipment usually make a career of railroad work, whereas experienced operators that have acquired their training on contract work do not adapt themselves to railroad conditions, with the result that their term of employment with the railroad is usually of comparatively short duration. Many such operators object to being transferred to different types of machines, and they also resent being displaced by senior employees.

The 1945 Red Cross War Fund Drive Is On. Who Will Not Give?

Showing Two Barco Unit Tampers in Use on the Boston Terminal Division

Section Gangs

In 1937 this road undertook a program to place mechanical spot tampers in the hands of all its section gangs in territory ballasted with crushed stone. Today, with the program substantially complete, the equivalent of 73 sections, representing about 680 miles of main-line tracks, have been equipped with Barco or Jackson spot tampers

A PROGRAM undertaken on the Boston & Maine in 1937 to equip with mechanical spot-tamping outfits all its section gangs in territory having stone ballast has now been brought to substantial completion, with the result that the equivalent of 73 such gangs, maintaining about 680 miles of main-line tracks, are now so equipped. Of these sections, each of 24 have two Barco unit tie tampers, and the equivalent of 49 are each supplied with a Jackson four-tool electric spot-tamping outfit. Moreover, in 1945 the company plans to acquire 20 additional spot-tamping outfits, of which two will be assigned to sections that were ballasted with stone last year, while 18 will be assigned to sections in heavy-tonnage territory that are ballasted with pit-run gravel. Further acquisitions of spot-tamping outfits for use in gravel-ballast territory, of which the company has a considerable mileage, will be predicated on the results obtained with the outfits to be acquired this year. In any event, as further mileages of track now ballasted with pit-run gravel are reballasted with stone, additional spot-tamping outfits will be acquired for assignment to the sections including these mileages.

Nearly 2000 Miles

Consisting of a total of 1,819 miles of road, the Boston & Maine has three principal main-line districts, all radiating from Boston, Mass. One of these extends to Portland, Me., and (with branches) is known as the Portland division; another, serving points in New Hampshire and contiguous areas, is known as the New Hampshire division; and the third, extending in a westerly direction to Troy and other points in eastern New York, is designated as the Fitchburg division. All lines within a radius of about 30 miles of Boston are incorporated in the Boston Terminal division. Between Boston and Portland the company has two main-lines routes, of which one, known as the East route, follows the coast for much of the distance, while the other, known as the West route, is farther inland. It is the latter route that carries the bulk of the heavy-tonnage traffic moving between these points. The principal main-line districts are largely double-tracked, including all of the Fitchburg division, nearly all of the West route and part of the East route of the Portland division, and a considerable mileage on the New Hampshire division.

Stone Ballasting Program

Prior to 1926 practically all main-line trackage on the B. & M. was ballasted with pit-run gravel. In that year the road undertook a program to replace the gravel ballast on its more important lines with crushed stone or washed gravel, which program is still in progress. Following 1928, all reballasting in connection with this program was done with crushed stone only, the washed gravel being eliminated. As of the end of 1943, stone ballast had been installed on nearly 680 miles of track, including 276 miles on the Portland division, 288 miles on the Fitchburg division, and 115 miles on the New Hampshire division. An additional 25 miles of track (12.5 miles of double-track line) were stone ballasted on the New Hampshire division last year.

When installing stone ballast, the practice is to renew all ties having a potential service life of less than 8 or 10 years. Subsequently, the track is given a major overhauling every 8 or 10 years, in which tie renewals are made and it is surfaced out-of-face, this work being done by large specialized extra gangs. In the meantime no ties are renewed and surfacing of the track is confined to spot-tamping by the section gangs. It was originally estimated that the periods between the heavy work programs would be 4 or 5 years, but as a result of various factors it was found possible to extend the periods to about 10 years. Between major overhaulings the track requires only a minimum of attention; hence it was possible to reduce the regular track forces. Furthermore, in connection with this phase of the program the sections were lengthened somewhat and the size of the section gangs was established at an average of 4 to 6 men and the foreman. Sections in stone-ballast territory consist generally of 9 to 14 miles of main-line track, depending on the amount of traffic carried.

Decides on Power Tampers

For a number of years after the stone-ballasting program was started the section gangs in the newly-ballasted territories continued to use hand tools for spot-tamping work, although in its out-of-face surfacing work, this road has used pneumatic tampers for many years. In view of the increase in wheel loads that occurred during the 'Thirties, it became apparent that the section gangs as then constituted and equipped would have difficulty in keeping up the track.

When confronted with this problem the company, instead of increasing the size of the gangs or shortening their territories, decided that the most economical solution would be to place mechanical spot-tamping equipment in the hands of the pres-

Get Spot Tampers

On the Boston & Maine

Shown in Operation Here Are Two Tampers of One of the Jackson Four-Tool Outfits

ent section gangs in territories ballasted with stone or washed gravel, thereby augmenting their capacity to do spot-tamping work. In reaching this decision, consideration was also given to the fact that tamping work done with power tampers has better lasting qualities than that performed by hand. Accordingly, a program was undertaken to place power-tamping equipment in the hands of all such gangs on the road. Since the decision to undertake this program was made before the outbreak of war, subsequent developments, bringing with them the acute labor shortage that still prevails, have strongly confirmed the company's judgment in embarking on this course.

Program Started in 1937

The first spot tampers acquired under this program consisted of 20 Barco unit tie tampers which were purchased in 1937. Since then 28 additional units of this type have been acquired, 20 in 1941 and 8 in 1942, making a total of 48, which are assigned in pairs to 24 section gangs. In 1941, the company acquired two Jackson four-tool electric spot-tamping outfits, these being followed by the purchase of 6 additional outfits in 1942, 20 in 1943 and 25 in 1944. Thus, the company now has 53 Jackson four-tool outfits, of which 48 are assigned to as many section gangs, while one is shared by five sections that are only partly ballasted with crushed stone.

To recapitulate, the company now has the equivalent of 73 sections equipped with mechanical spot tampers, including 18 on the Portland division, 10 on the New Hampshire division, 26 on the Fitchburg division (the five sections sharing a Jackson outfit are counted as one in this figure), and 19 on the Boston Terminal division. As already indicated, 20 additional outfits are to be obtained in 1945, two of which are to be assigned to sections that were ballasted with stone last year, while 18 are to be allotted to sections ballasted with pit-run gravel.

Since the Barco tampers are assigned to the sections in pairs, four-man gangs are considered adequate to handle these tools with full efficiency and effectiveness. The availability of only two units on each section, however, is not generally sufficient to permit all necessary spot-tamping work to be performed with the power units; hence the practice generally is to employ the Barcos for tamping the ties at and adjacent to the joints, this constituting the major part of the work, and to carry out intermediate spot-tamping by hand.

When the Jackson tampers were introduced it was considered desirable to use them in four-tool rather than two-tool outfits. In view of the fact that the smallest power plant available for use with these tools is designed to operate four tampers, the use of a full complement of tools means that the power plant will be employed with maximum efficiency. Also, with four tools available, all spot-tamping work can be done by machine. Finally, consideration was given to the fact that the availability of a four-tool outfit on each section would make it easier to obtain an 8 or 12-tool outfit by bunching gangs, if it should become desirable to use the spot tampers for out-of-face surfacing. While the electric tampers are in some cases used by gangs of four men, it is recognized that they can be employed to better advantage and with greater efficiency if assigned to gangs with six men.

Repairs and Maintenance

To avoid delays and lost time in the use of the spot tampers, the problem of keeping them in a condition of proper repair and maintenance has been given careful consideration. Because of the basic differences in the two types of equipment used, the maintenance practices developed for each type vary accordingly, although they have certain aspects in common. In both cases the motive is to avoid delays to the work of the section gangs by anticipating trouble and remedying it before a breakdown occurs. One of the safeguards employed is to require that all spot tampers be inspected about once each month during the working season by the company's equipment inspectors. At these times the inspector observes the machines in operation, and notices particularly whether they are overheating. He also discusses with the foreman any difficulties that may have been encountered with the tampers, and makes any adjustments that may be found necessary.

The findings of the inspector are noted on a report that is sent to the supervisor of work equipment, with a copy to the division engineer. If any major repairs are indicated they are made either by the local motor-car repairman or, if he is not available, a mechanic from the system work equipment repair shop is sent out to do the work. In addition to the monthly inspections, the motor-car repairmen are instructed to inspect the tampers whenever the opportunity presents itself and to submit reports on their findings. With both types of machines the foremen

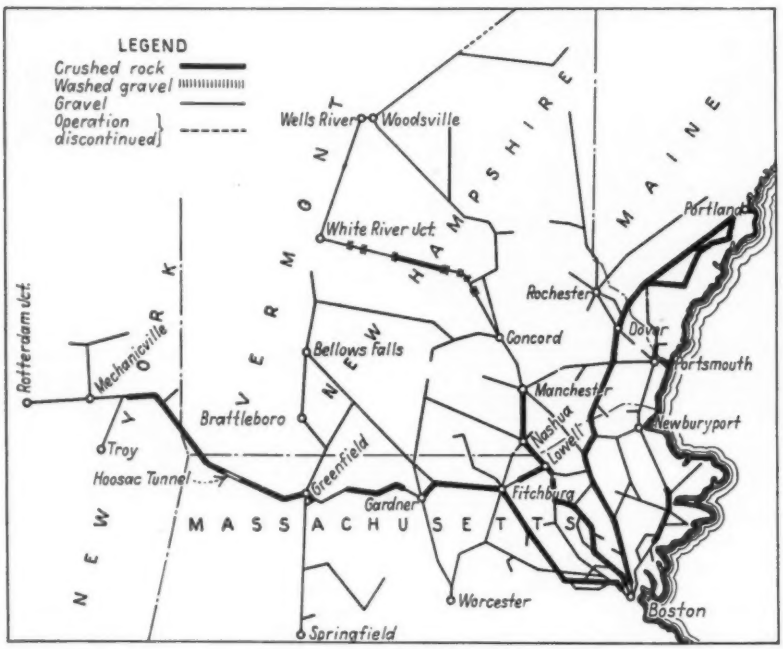
are permitted to make minor adjustments, and in addition have certain other duties which are taken up later under separate discussions of the two classes of equipment.

Barco Practices

When Barco tampers are first introduced on a division the practice is to hold a demonstration, before a regular division meeting of track foremen, showing the approved method of dismantling the tampers, removing accumulated carbon, and reassembling them, a procedure that the foreman is ordinarily expected to perform on each tool after about each 70 hr. of operation. These demonstrations are made by the company's gas-engine inspectors.

Incidentally, this road s now conducting a test involving the use of a special lubricant, known as MacMillan ring-free oil, in Barco tampers, which, if preliminary observations are confirmed, gives promise that it may be possible to operate the tampers for considerably longer periods before carbon removal becomes necessary. This test is being conducted with eight tampers, all using the special lubricant. In four of the tampers SAE 50 oil is being used, while the other four are being operated with SAE 30 oil (the regular practice is to employ SAE 70 oil in these machines). At the time of this writing, four of the tampers (those using SAE 30 oil) had already operated more than 600 hr. without the formation of appreciable carbon. Another observation was that the tamper engines were running somewhat cooler than normally would be expected.

The usual practice is to place the Barco tampers in the tool tray of the section motor car when transporting them to and from the job. Ignition current for each tamper is supplied by a dry-cell battery at the end of 8 ft. of cable. When one of the batteries in use on a particular section runs down it is replaced by a spare battery that is kept on hand for this purpose, and a new spare is obtained. Also, each foreman usually keeps two spare tamping bars on hand. When the two in use become worn to the point where repair is necessary, they are replaced by the spare bars. The worn bars are then sent to a central point where they are restored by welding, after which the wearing surfaces are coated with a hard-surfacing rod to obtain maximum service life.



Map of the Boston & Maine Showing the Types of Ballast on Its Different Lines

Fuel Supplies

Since the Barco tampers have two-cycle engines, the fuel used consists of a mixture of gasoline and lubricating oil. On the B. & M. each section foreman has a gasoline storage tank, and if the motor car used happens to be of a type with a two-cycle engine, a supply of lubricating oil is kept separately for admixture with the gasoline in the proper proportions at the time the motor car fuel tank is filled. This same practice is followed in regard to the Barco tampers.

At the end of each working season the Barco tampers are sent in to the company's work equipment repair shop where they are completely overhauled.

Jackson Tampers

In the Jackson outfits the tamping tools each consist essentially of an unbalanced motor and a. tamping blade to which a vibratory action is imparted by the motor. Power for operating the motor is supplied by a gasoline-engine-driven generator which is mounted on two pneumatic wheels for ready portability. The power plant used is known as Model WS4. For transporting these outfits to and from the job a trailer car is used.

The tamper blades used with the Jackson tampers are of different shapes and sizes depending on the conditions under which they are to be used, and have replaceable tips. For its spot-tamping work in stone ballast the B. & M. uses tips of the step-cut design. As with the Barco tampers, a number of spare blades are kept on hand by each foreman for use when the blades in service become worn to the point where repair becomes necessary. Here again, the worn tips are restored by welding and are then treated with a hard-facing rod.

Renewal of Rotor Bearings

Under conditions of more or less continuous operation the rotor bearing in each of the electric tamping tools is likely to need renewal every few months. Since experience on the B. & M. has shown that this operation is best performed in the shop, a set of six spare tamping tools is kept on hand at its work equipment repair shop for use as replacements when tools in the field must be sent in to have the rotor bearings renewed. To preclude delays to the work, the foremen are instructed to observe the tampers carefully and to note especially whether the motors are becoming overheated. When this happens, and it is apparent that the rotor is at fault, one of the spare tools is obtained and the defective unit is sent to the shop.

Since the power plants for the Jackson tampers are driven by four-cycle engines, the fuel used is straight gasoline which each foreman obtains from his regular supply. Aside from making the neces-

sary adjustments that are required from time to time in the power plants, the foremen are expected to change the crankcase oil as required, which is about once a week during continuous operations, and to renew the armature brushes when necessary. Eventually it is expected that the practice will be followed of sending the electric tamper outfits to the shop once each year during the winter months for a complete overhauling, although to date this policy has not been put into effect.

Manual of Instructions

The road now has under preparation a manual of instructions covering the maintenance and operation of its Jackson tampers, which is being compiled for the information and guidance of the foremen using these machines. The instructions will cover such matters as the proper lubrication of the tampers, including the power plant; the system to be employed in ordering spare parts; the procedure for exchanging defective tampers; the manner of detecting bearing failures; and the proper procedure for dismantling and lubricating the tamper motors.

When using the electric tampers in double-track territory on this road, it is frequently considered desirable to tamp the ties in both the tracks as the work progresses. This, however, presents certain problems for it is not considered desirable to place the power plant in the inter-track space, and if it is placed on the shoulder the 35-ft. cable leads ordinarily used do not give a sufficient range of operation on the opposite track. To correct this situation the company is contemplating the use of a 100-ft. extension cable with each power plant, which, with the latter located on the shoulder, will extend under the rails of the near track to a junction box in the inter-track space. With four outlets in the junction box it will be possible to plug in the regular leads for the tamping tools, and thus to obtain an even greater range of operation than if the power plant were located in the inter-track space.

The program on the B. & M. to equip section gangs with power tampers is under the general supervision of T. G. Sughrue, chief engineer, and H. F. Fifield, engineer maintenance of way. Direct supervision over the maintenance and repair of the tampers is exercised by C. L. Fero, supervisor of work equipment.

C. & O. Track Awards

IN 1944, the Chesapeake & Ohio continued the practice of making periodic track inspections with its special roadway inspection car. As in the two years preceding 1944, however, the track condition data were obtained by attaching this mechanical recording inspection car to regular trains, instead of operating special trains for this purpose. Because restricted materials and the man-power shortage have taxed the resourcefulness of roadway maintenance forces, the C. & O. management considers it highly essential that periodic track inspections be continued, to provide definite information regarding the physical condition of the property.

The 1944 track awards on the C. & O. were based on year-around records, established by combining the inspection records made by the car in March, July and November and, following past practice, the different territories were classified into five groups according to the character of track and type of traffic, to permit judging on a comparative basis. These classifications were as follows: Group 1—double-track main lines, freight and passenger traffic; Group 2—single and double-track main lines, principally freight traffic; Group 3—single-track main lines, principally passenger traffic; Group 4—secondary branch lines; and Group 5—yard and terminal territories. As in 1942 and 1943, the secondary branch lines were not inspected and the recommendations of local officers were used as a basis for awarding prizes to two sections on each district on such lines.

Cash Prizes

In Groups 1 and 2, prizes of $50, $40 and $30 were awarded respectively to the supervisors receiving the first, second and third highest ratings in each group, and in Groups 3 and 5 prizes of $50 and $40 were awarded respectively to the supervisors having the first and second highest ratings in each group. In addition, a prize of $50 was awarded to one supervisor in Groups 1 and 2 and to one supervisor in Groups 3 and 5, whose territories showed the greatest relative improvement as compared with the previous year. Among the track foremen, prizes of $25 and $15 were awarded for the first and second best maintained sections on each supervisor's territory. The winning supervisors in the various groups were as follows:

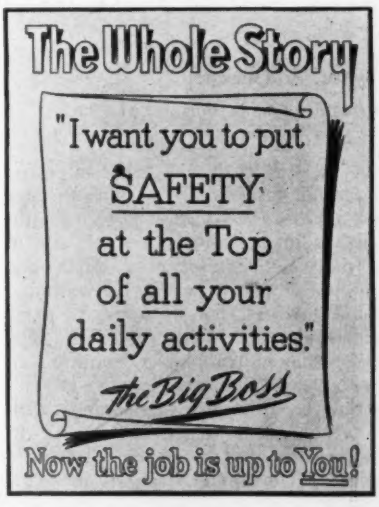
Group 1—First prize—C. E. Butcher, Cincinnati district, Cincinnati division; Second prize—G. C. Coyner, Ohio River district, Cincinnati division; and Third prize—J. H. Poindexter, Peninsula district, Richmond division.

Group 2—First prize—H. S. Chandler, Rivanna district, Richmond division; Second prize—J. F. Painter, James River district, Clifton Forge division; and Third prize—O. L. Nelson, Paintsville district, Ashland division.

Group 3—First prize—G. E. Bostic, Mountain district, Clifton Forge division; and Second prize—W. E. Amburgey, Lexington district, Ashland division.

Group 5—First prize—L. H. Lucas, Maumee district, Hocking division; and Second prize—C. C. Madison, Russell division.

The improvement prize for Groups 1 and 2 went to C. E. Butcher, supervisor, Cincinnati district, Cincinnati division, who also won first prize in Group 1, while that for Groups 3 and 5 was awarded to W. E. Amburgey, supervisor, Lexington district, Ashland division, who also won second prize in Group 3.



This Poster, No. 258, Constitutes the March Installment of the "All the Year—Every Year Safety Program" of the Safety Section, Association of American Railroads

Some Roads Have Mechanized Their Bridge Maintenance Operations to a High Degree

Should Bridge and with Power

RECENTLY, the chief maintenance officer of a large road, anxious to insure the greatest efficiency and productivity of his bridge and building forces, raised a question concerning the practicability and economy of mechanizing these forces for their wide variety of operations. He was inclined to believe that the facts would justify much further mechanization than on his road at the present time, but he wanted to *know* from the experience of other roads, and from the experience of other practical supervisory officers familiar with bridge and building work.

Answers to the many phases of the question raised have been published in the pages of *Railway Engineering and Maintenance* in the past, but following are additional statements, giving the experiences and opinions of other supervisory officers, presented with the hope that they will not only be of interest to the one chief maintenance officer who has raised the question, but to other maintenance officers as well, in helping them to determine the extent to which their bridge and building forces can, to advantage, be equipped with power tools and machines. [Editor]

Many Power Tools and Machines Cut Costs and Improve Results

By W. A. Huckstep

General Building Supervisor,
Missouri Pacific, St. Louis, Mo.

UNQUESTIONABLY, a bridge and building gang equipped with proper power tools and machines can accomplish a larger volume of work, and in a more efficient manner, than one equipped alone with conventional hand-operated tools. During the present emergency, with the insufficient labor that is available to maintain all bridge and building gangs at full strength, equipping these gangs with power tools and machines will, in many cases, in part at least, have the effect of bridging the gap in manpower.

Just what power-operated tools and machines can be used effectively by bridge and building gangs will depend upon the particular class or classes of work that the individual gangs are called upon to perform. On some railroads, and even on different divisions of other roads, certain gangs perform principally bridge work, other gangs building construction and repair work, while other gangs perform largely painting work and still others are engaged entirely in plumbing and water service work.

Portable power units, such as gasoline engines, gasoline-powered generators and gasoline-powered air compressors, equipped with a variety of tools and equipment, specially designed to operate with each type of power, are highly suitable for "on line" work where no fixed sources of power are available. Some of the power-operated tools which have proved most effective for bridge and building gangs include chain saws, hand-held circle saws, rip saws and other wood-working saws, wrenches, augers, drills, vibrators (with tool attachments), nut runners, concrete breakers, hammers, rotary grinders, portable pumps, floor sanders and paint spray machines.

While not generally classed as power-operated equipment, consideration should also be given in any program for equipping bridge and building gangs with labor-saving tools and equipment, to the inclusion of low-pressure type paint-burning outfits, operating with propane gas, and also to modern types of asphalt and coal tar heaters, designed to burn fuel oil, soft coal or wood. The use of this equipment will result in a material saving in labor and a more satisfactory finished job.

Many Uses—Large Economies

Gangs provided with power-operated tools and machines are constantly finding new and unusual uses for them, beyond those for which they were specifically designed. This has resulted in additional savings in labor. Vibrators with buffing attachments are very desirable and will produce better-finished concrete work than can possibly be secured by hand methods without an excessive amount of labor.

Estimated Savings Over Hand Methods Through the Use of Various Types of Power Tools

	Percent
Vibrator machine with tool attachments	25 to 30
Paint spray machine	30 to 60
Sandblasting machine, cleaning steel tanks, steel bridges, etc.	30 to 50
Concrete breaker and portable pump, when used where excessive amount of water or large amount of rock or shale is encountered in excavation work	50
Various types of saws	30 to 50
Drills	40 to 50
Wood boring machines (augers, etc.)	50
Rotary grinders, using 4-in. and 6-in. cup-type steel wire brushes and 8-in. radial-type steel wire brushes, for cleaning rust, paint, etc., from steel	40 to 60
Low-pressure paint-burning outfits	50

Building Gangs Be Equipped Tools and Machines?

Here's the Answer, Mr. Maintenance Officer

Carefully Selected and Used Power Equipment Will Make Good

By G. S. Crites
Division Engineer, B. & O.
Baltimore, Md.

THE INVESTMENT in power tools and equipment, whether for bridge and building work or for any other purpose, must earn a profit or it is not justified. A machine or tool that is idle, either from non-use or because of a break-down, is a liability. For this reason, the purchase and placement of equipment must fit the particular needs or peculiarities of the road or sub-division for which purchased.

Contractors driving tunnels soon found that the use of power tools and equipment got them jobs and earned profits, so it was no far step to the mechanization of railroad tunnel gangs. To avoid the gasses from carbon oil lights, electric lighting systems were installed, and to avoid asphyxiation, blowers were put in. With electricity and air available, tools could be powered. Today, the ingenuity of those in charge of the work is the only limit to the extent to which mechanization may go in carrying out work in new or old tunnels. The personnel of tunnel gangs, with few exceptions, is of high quality, a fact which is due in no small measure to the type of equipment supplied them.

Some roads do not have separate tunnel organizations, but where this is the case one or more bridge or building gangs is usually equipped for tunnel work. The equipment of these gangs may be housed in cars or otherwise made portable so that it can be set off wherever desired, whether at a tunnel, a bridge, or a building. Such large mechanized gangs have a tendency to cause the spread of power tools and equipment to smaller gangs, such as those engaged in routine building, concrete, paving, fencing and painting work. Usually, there must be a demand for such equipment by the gang if the best use is to be made of it and the largest savings made.

On those roads which have a predominance of steel bridges and other metal structures to build and maintain, mechanization has usually started with their steel gangs. Some roads

Building Work Offers Many Opportunities for Mechanization

Concrete breakers are useful in installing frame trestle bents where shale rock is encountered, and in providing post holes for stock pen fences, etc., where sandstone is present. In the accompanying table are estimates of the labor savings possible through the use of some of the power-operated tools and machines referred to.

Motor trucks should be considered in any program looking to a saving in labor and to the increased efficiency of bridge and building gangs. It is important, of course, that such trucks be specially equipped for the particular functions to be performed. To illustrate, it may be that water service men could make most effective use of a truck equipped with a 10 or 12-ton power hoist for use in repair work on deep wells, etc. Such a truck could be moved promptly over highways from point to point and could avoid the necessity of moving equipment on tool cars by rail, sometimes through terminals, where delays are frequent.

If a bridge and building gang is located permanently at a terminal point where electric power is available, a carpenter shop, fully equipped with electrically-driven tools can be developed into a real labor-saving facility. At such a shop, all types of small wood frame roadway buildings, such as telegraph and telephone cabins, tool houses, motor car houses, small depots and passenger shelters, crossing watchmen's cabins, toilets, coal houses or bins, etc., can be fabricated and shipped to destination and placed at a considerable saving in labor cost over performing such work in the field with ordinary hand tools. In a carpenter shop of this character also, station and office furniture, settees and other equipment from points over the entire division can be repaired, reconditioned and refinished at appreciable savings in cost.

have built up well-equipped bridge gangs for erecting all kinds and sizes of steel bridges, and may also have smaller, fully-mechanized gangs to erect steel tanks and the frames of steel buildings. In an emergency, these gangs can be doubled up with less well-equipped gangs. Where this is done, there usually developes a demand for equipment among the less adequately fitted gangs. This is a healthy situation if properly nurtured.

Not much will be accomplished by grabbing a lot of catalogues and ordering all of the equipment that any gang thinks it could use to advantage. A machine or tool must be the right one for the task at hand, and must be kept in use until its task is done. This is extremely important where the movement of trains may be affected by the inadequacy or failure of a machine. A salesman does his firm, and also the railroad, a high dis-service by selling a machine that will not, with proper operation and care, prove both economical and suitable for the job to which it is assigned.

Where bridge and building gangs have been tooled and machined without careful consideration to the above factors, many inconsistencies and abnormalties are likely to attach themselves to their operations. If a tool or machine has not paid for itself within a reasonable period of time, its performance should be analyzed, and if there is no way to make it earn its keep, it should be disposed of. Often, the poor performance of a single machine or tool may unjustly mitigate against the purchase of more suitable ones for the same purpose.

Instruction Important

Where tunnel, steel, concrete or other gangs have not already set the pace for equipping bridge and building forces with power tools and equipment, properly equipped shops are good places to get a measure of the value of many power tools. Of course, all shop tools will not be suitable for road work, nor will all road tools be suitable for shop work, but there is common use for many. Those machines and tools, such as air compressors; riveting, chipping and jack hammers; rivet cutters; portable tool grinders; timber saws; paint spray outfits; portable pumps; welding outfits; wood borers; etc., should be tried out in the shop, and those who are to use and care for them should be fully instructed as to their operation, lubrication and care in all other respects. The time spent in getting appliances started right will go a long way toward using them effectively and in getting the most out of them.

Tools such as air hoists, paving breakers, power jacks, pipe pushers, grout pumps, power winches, concrete mixers, pipe cleaners, etc., are among those which are used almost exclusively for road work, but regardless of where power tools are used, someone thoroughly familiar with them should instruct the users not only in their operation and care, but also in detecting faulty or defective performance before the difficulty becomes serious.

The manufacturers of power tools and equipment are constantly on the alert to improve their products. Those in charge of maintenance of way work should be equally alert to find economical ways to allow air, electricity, steam, gasoline and oil to do their more arduous tasks for them, and thus relieve the strain on workmen. This will make for more alert workmen and for more and better output. This has been demonstrated repeatedly and clearly during the last 15 years when man-power for bridge and building maintenance work has been none too plentiful.

Present Conditions Demonstrate Value of Equipping B. & B. Forces

By A. M. Knowles
Engineer of Structures (Retired),
Erie, Winter Park, Fla.

THE great cry on the railroads today is more production with fewer men to keep their facilities adequate and safe for the handling of the largest volume of business ever moved over the rails of the country. While structural maintenance, known as B. & B. work, is perhaps no harder hit in general than the work of other departments of maintenance, such as the upkeep of tracks and rolling stock, conditions have made it essential for maintenance officers in charge of B. & B. operations to develop ways and means of doing their work—a larger amount, if necessary—with fewer men. This could only be done by improving the efficiency of their manpower, by lengthening the hours of service, or by improvising short cuts and improved methods of doing work.

The drawing off of experienced bridge and building employees has forced the employment of inexperienced men, generally below or above the draft age. This has tended to cut down the average quality and quantity output of the individual workman in the skilled brackets. This condition can, of course, be offset to some degree by giving special training to the new men hired, but it cannot make up in a short time altogether for experience. Some work can be expedited by extending the working period beyond the regulation hours per day or week, at the added cost of premium rates of pay, but not much is gained in this manner, at least economically.

The old adage, "necessity is the mother of invention," has been proved true again in this emergency through the development of short cuts, improved methods, and more intensive use of power tools and equipment adapted to present conditions.

One phase of bridge and building work with which I have had the most experience deals with the renewal, renovating, strengthening and repair of steel bridges and other steel structures, such as turntables, coal and ash storage and handling facilities, shop buildings, crane runways, etc., on a complete railroad system. This work has been handled by the engineering department in co-operation with the maintenance of way department.

The field organization for this work is composed of five to seven traveling steel gangs living in camp cars, and one shop steel gang directed by a supervisor of bridges. The size of the gangs varies from 8 to 15 men, including the foreman, depending on the nature and size of the job, it being sometimes necessary to transfer men from one gang to another or to double up the gangs in order to provide an adequate force. The organization also includes a locomotive crane foreman and fireman on a 60-ton, self-propelled crane, used when necessary for heavy-duty work.

Gangs Well Equipped

Prior to the war, all of the gangs were well equipped with the usual steel-gang work equipment, such as motor cars, push or trailer cars, oxy-acetylene cutting outfits, 200-cu. ft. air compressors with flanged and transverse wheels, tanks of water-pumped nitrogen gas for drilling holes and for driving rivets with small gang, and with air-operated riveters, superior and short rivet busters, bash out and chipping hammers, holders-on, steel and rock drills, reamers, impact wrenches, grinders, wood borers, cleaning and scaling tools, etc. All traveling outfits were also equipped

with a self-contained, gasoline engine-driven electric generators for lighting the camp where no other electric current is available, and for use in emergencies to supply light on night jobs.

In addition to these facilities, utility air hoists, electric welders, circular saws, paint-spray outfits, 25- to 100-ton mechanical and hydraulic jacks, 1- and 2-ton utility derrick and steamboat ratchets were provided in sufficient numbers to meet their usage need. These were shifted from one gang to another as required. One 2½-ton auto truck was also available to the steel gangs, but was used largely at terminals.

Since the onset of the war, additional air hoists, electric welders, a small compressor, four 20-ton air jacks and two additional 1½-ton auto trucks have been supplied for the traveling gangs. When jobs require the use of locomotive and crawler cranes, chain saws or other machines, this equipment is supplied by the maintenance department.

All of this equipment, except the track units, together with supplies of materials, is carried in tool cars. Several of these cars have recently been equipped with hand chain hoists on trolleys, operated on a sliding trolley beam. The trolley beam can be projected out the doorways of the car to handle electric welders and other heavy equipment and materials into and out of the cars.

The shop gang has also been supplied recently with a rod and pipe threading machine and an air-operated forge. A shop hand hoist runway has recently been extended outside the fabricated shop building in two directions to handle material from the stock yard, through the shop, to the assembling yard. Also, a unique home-made rod bending device has been developed by the shop men, utilizing second-hand locomotive steam cylinders converted to use air.*

Examples of Effective Use

These additional facilities filled gaps found under conditions prevailing at this time and have helped materially to expedite the work. For example, the welding machines provided the gangs, including the shop gang, have permitted more repairs to be designed for welding than before. This has reduced costs and, in many cases, has resulted in a better job than could have been obtained by riveting.

The air hoists provided were used recently on an extensive viaduct-strengthening job, where they eliminated the use of a locomotive crane in bringing out and lowering the steelwork in place. These hoists saved their cost several times over on this job alone and permitted the strengthening work to proceed in a safer manner, regardless of traffic, without any delays whatsoever to trains.

On the same viaduct job, pipe scaffolding was used around the 200-ft. towers, and proved to be better and safer to work on than the usual hanging scaffolds. Furthermore, this type of scaffolding proved indispensable, as it developed that not many of our old or our new bridgemen would have worked in the towers without it. As it was, only a selected few of the men would work on the scaffold at such heights, especially during the winter months.

The air rivet passers also used on this viaduct and on other jobs have prevented the loss of many hundreds of rivets which would have been missed by the hand passing and catching method. They also eliminated the chances of hot rivets dropping onto men working on the lower parts of the towers, unless work below the riveters was suspended.

On another long viaduct, to facilitate the cleaning and application of a protective coating to the steelwork on the top flanges and bracing of the girders, the 20-ton air jacks were used to lift and lower the complete track deck intact. In such work, the raising and lowering is done in 1½ min. for each operation. The jacks are placed below the deck and are moved from span to span below deck, where most of the men work, leaving no obstruction on the track to be removed to permit the passage of trains. This method not only lowers costs, but also results in a more thorough job than can be done by any previous method.

The trolley hoists in tool cars have made the loading and unloading of heavy units safer and easier, with less men than before. The bolt and pipe threader eliminates transferring materials to another shop and back again for this service, saving time and expense. The extension of the hoist runway at the shop precludes the handling of materials and reduces costs. About 200 tons of steel were handled on this runway for one job alone. The rod bending device at the shop was used recently to bend into hairpin loops about 700 1⅛-in. and 1½-in. round rods for one job, and the work was done more accurately and quickly than could have been done by ordinary methods.

The company structural shop has been a great asset at all times, but especially during the present war emergency. It has provided means under our own control whereby materials can be fabricated when required, provided the need for these materials is anticipated well in advance of their use.

Building and Masonry Gangs

In the other branches of bridge and building maintenance, dealing more with wood, concrete, brick and stone masonry construction, and with plumbing, there are other units of equipment and small tools that are well adapted for use, all of which have been in service on many roads for a considerable time, or which have been added in recent years. These include locomotive cranes, draglines and pile drivers, together with extra steam hammers and leads; jetting pumps; orange peel and clam-shell buckets; sand blast outfits; power saws; drills; augers; planers and edgers; portable light and power plants; drill pressers; electric or air-operated pipe threaders and cutters; blacksmiths's outfits; and sewer cleaning machines.

One road in particular, after making tests, plans to equip each of its bridge gangs with electric generator sets, lighter than the present 6-kw., a-c outfits, mounted on heavy-duty motor cars, with a total weight of about 3800 lb. These new outfits, will be 3-kw., 110-volt d-c gas-electric generator sets, weighing about 280 lb. For its building repair gangs, 2-kw., 110-volt d-c generators, which are still lighter units, are being considered. It is expected that greater use will be made of these lighter units on small jobs, as well as the larger jobs, and that they will be better adapted to the smaller gangs, which find present large units too heavy.

There Is No Worthier Cause Than the Red Cross Drive for Additional Funds.

*A detailed description of this shop appeared in the issue of *Railway Engineering and Maintenance* for May, 1944.

Work Equipment a "Life-Saver" for Roads Battling Record Snow

Despite unprecedented weather conditions and a critical man-power shortage, eastern railways keep war freight rolling by extensive use of snow-fighting equipment

THIS winter the railroads in northeastern United States, and particularly those in western New York, have fought the worst weather that "old-timers" can recall in their many years of railroad experience. During this battle, with record snows, almost continuous high winds and low temperatures, more reliance than ever before was placed on the intensive use of work equipment. This was essential, especially because of the general man-power shortage prevailing, which made little additional labor available for snow-removal work. Despite conditions, war traffic was kept moving, which is a tribute to the resourcefulness and loyalty of the railroad men in the storm areas. It is also testimony of the value of adequate work equipment for meeting such emergencies.

Record Snows

While the present winter has been severe throughout the entire section of the country east of Chicago and north of the Ohio river, the most extreme weather conditions have obtained in a belt about 100 miles wide, extending from Erie, Pa., to Albany, N. Y. In this area, the total snowfall exceeded 120 in. at one point, and much of it was accompanied by high winds and continuous low temperatures, both of which prevailed for many weeks. Buffalo, N.Y., for example, has had 106 in. of snow, Rochester, 84.4 in., Utica, 78 in., Watertown, 106 in., and Syracuse broke all previous records with a total of 120.8 in. In comparison, Cleveland, Ohio, has had more than 50 in. of snow, Pittsburgh, Pa., more than 45 in., and Boston has had 58 in.

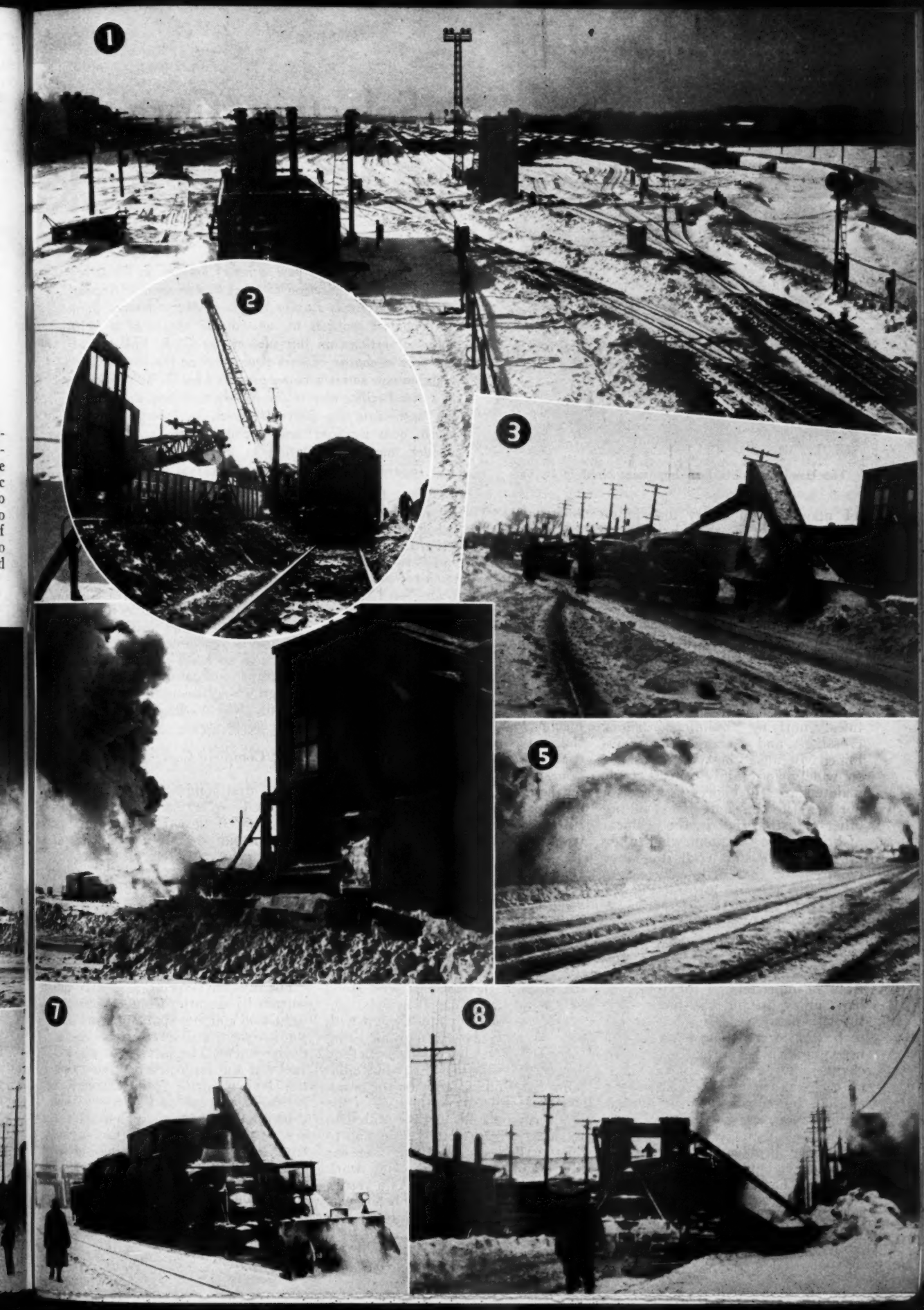
The first bad storm in the Buffalo area occurred on December 11 and 12, when about 15 in. of snow fell, accompanied by high winds. A similar storm occurred on December 27, following which a thaw and warm rain, on New Year's day, saturated the snow. The following day, a quick freeze froze cars to the rails and was accompanied by a blizzard with about 15 in. more snow and winds of gale intensity. This tied up many cars in yards, and for some time after January 2, most of the yards in the Buffalo area were in bad shape, since there was no let-up in the severe weather conditions for five weeks. Some additional snow fell almost every day, accompanied by 30-60 m.p.h. winds blowing from Lakes Erie and Ontario, so that drifts formed almost as fast as lines and yard tracks could be cleared. In yards, snow drifts up to the car floors were not uncommon, and in many places drifts extended to the car roofs.

On the main lines, a large amount of power was required to operate snow plows and Jordan spreaders ahead of trains, and the tonnage rating of all locomotives had to be greatly reduced. As a consequence, the tremendous flow of eastbound traffic began to slow down and cars began to accumulate as far west as Chicago and St. Louis, Mo., while the flow of empty cars from the East, back to mines and factories, was also curtailed seriously.

(Continued on page 287)

Pictures Tell Story

(1) Yard Conditions at Buffalo, N.Y., are Illustrated By This View of the New York Central's Westbound Classification Yard at That Point. (2) Loading Snow With Locomotive Cranes Near the N.Y.C. Enginehouse at Syracuse, N.Y. (3) Snow Loader and Trucks Clearing Snow From City Streets and Tracks of Bessemer & Lake Erie at Erie, Pa. (4) Jordan Spreader Working in the Westbound Receiving Yard of the N.Y.C. at Buffalo. (5) Rotary Snow Plow in Operation on the St. Lawrence Division of the N.Y.C. —Note Wedge Plow in Background. (6) Crawler Shovel Loading Snow From Street and Tracks of B. & L. E. at Erie. (7) Snow Loader and Melting Tank in Operation on the Boston & Maine at Boston, Mass. (8) Jordan Spreader on the B. & L. E. at Erie.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The Hand Car—Filled an Important Need in Its Day

Selection, Care and TRACK

This is the first of the new series of articles on the selection, care and operation of track motor cars, to appear serially in *Railway Engineering and Maintenance*. Born of repeated requests for unavailable copies of a 1930 series of articles on this subject, by C. R. Knowles, at the time in charge of work equipment on the Illinois Central, the new series is being prepared by G. R. Westcott, Missouri Pacific, who is completely rewriting and bringing up-to-date the previous series, to incorporate the latest considerations and recommended practices of builders and users relating to the selection, care and operation of these highly important machines

IT may be said safely that in no other industry is the plant to be maintained so widely and thinly spread as on the railroads of the country. To be sure, in its shops and terminals there will be found a considerable concentration of facilities for the maintenance of equipment and the handling of freight and passengers; but stretching between these concentrated groups are miles of lines, with roadbed, tracks, bridges, signals, communications lines, outlying buildings, signs, crossings, and fences to be maintained. Because these facilities are so widely and thinly spread, their maintenance introduces a problem not found to the same extent in any other industry; that is, the problem of bringing to the point where they are to be applied, materials and labor required for that maintenance.

For this purpose the track motor car has, in the forty years or more since its introduction, proved its worth in constantly increasing use. Whether the need is for the transporting of one man or a large gang from headquarters to the job, perhaps miles distant, the motor car, through many years use, has come to be considered the answer to the need; and more recently, due to changes in train service, it has taken on to a much greater extent the added function of distributing maintenance materials.

Because of the service rendered by it, the problem of the proper maintenance and operation of the motor car has become of increasing importance. This problem has not yet received the recognition that it deserves. The function of the motor car is often considered supplementary in maintenance work, and correctly so. In many of its uses, the results of its work are indirect; the moving of men, tools, or even materials to the job does not seem so definitely a part of the work of construction or maintenance as does the work of tampers, power wrenches, concrete mixers and other roadway machines. Since its work is indirect, the fact is often overlooked that its use makes productive many man hours of labor that would otherwise be non-productive; and in consequence of this attitude toward it, too little care and thought are given to its maintenance and operation.

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Development of the Motor Car

The motor car is an outgrowth of the push car, which, as its name indicates, was first propelled along the track by men walking beside the car or by poles shoved against the ends of ties by men who stood or sat upon the car. The next development was to equip the car with a crank and gears, the crank being turned by two men. This method was further improved by the installation of two pulleys, one on the crank shaft and another on the axle of the car, the power being transmitted to the axle by a belt. The objection to this method of propelling the car was that only two men could work at the cranks at a time. As a result, the idea of the walking beam was borrowed from the old town fire pump, the power being transmitted to the axle by means of a crank and gear which engaged a smaller gear on the axle. Out of this came the hand or lever car, which was a decided improvement over earlier methods of propulsion, as it not only permitted the entire gang to work at the levers but effected a marked increase in speed. This lever car, with but few modifications of the original design, is still used to a limited extent, where the distance to be traveled is small.

First Complete Cars

The first complete motor cars, introduced in 1896, were of the side-load type, designed to carry one or two men in what is now known as "light inspection" service; i.e., by roadmasters, supervisors or other men working alone or in pairs. As the practicability of these small cars was demonstrated, larger ones were built to carry a greater number of men. Viewed from present-day standards, the earliest of these cars were crude in some respects, and often uncertain in operation. The carburetor, induction coil and spark plug as now known were still in the process of development. The mixing of air and fuel was accomplished by permitting the fuel to drip down through a series of screens and wicks within a metal box through which the air was drawn. Much of the engine trouble experienced with the earlier cars was due to the difficulty of maintaining a suitable mixture of fuel and air. The ignition, by means of the low tension "make and break"

Operation of MOTOR CARS

By G. R. WESTCOTT
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system, was never well adapted to motor car service, but was the best available at that time.

During the period from 1896 to 1905, there was marked development. Larger cars of the center-load type for gang use were made available.

The Author

The author, long a diligent student of maintenance of way work equipment and of mechanized methods of doing maintenance work, is assistant engineer on the Missouri Pacific, at St. Louis, Mo., where for a number of years he has been in direct charge of all matters relating to the selection, operation, maintenance and repair of all classes of maintenance of way power machines and tools, including track motor cars. He has written many articles and papers pertaining to work equipment, and, since 1930, has been a member of the Committee on Maintenance of Way Work Equipment of the American Railway Engineering Association, of which committee he served as chairman, directing its activities, during the years 1938-1942, inclusive.

The carburetor and the high tension "jump spark" system of ignition were developed. However, the use of the motor car for general service progressed slowly. Labor was plentiful and wages low, and the railroads seemed reluctant to replace their time-tried lever car with the newly developed motor car. The employees, however, welcomed the new means of transportation enthusiastically. About 1910, some engines were being purchased by gang foremen and applied to the lever cars or push cars assigned to them. The first engines so applied were not built for this use but were adaptations of engines designed for other purposes. Engines specifically built for motor cars use quickly followed, and many such applications were made.

Although the car of this early period had achieved such a measure of reliability that even in the hands of an inexperienced operator, its return to the starting point without serious delay or trouble could usually be expected, it was not wholly satisfying. It lacked power, especially on heavy grades or in locations where wind resistance was high. It was somewhat awkward to handle and could not be removed from the track as readily and quickly as could be wished. It lacked many of the safety appliances that have, in recent years, come to be considered necessary. Its weaknesses were noted by the users, and the word passed back to the builders who were quick to correct them; and while further development was not rapid, it has been continuous.

Safety an Objective

Safety in operation has been the aim of many developments. Some of these were involved in the design of the car, as for example, the substitution of the free-running engine for the direct-connected type. Other developments have been in the nature of accessories, which while they increased the weight of the car, unquestionably promoted safety.

The safety of the car itself, and frequently of the operator and other employees, depends much on the ease and speed with which it can be removed from the track. This has become more important as the speed of trains has increased so greatly in recent years. Much thought has been given to weight reduction and to the design of the car that would promote ease of handling. The adoption of the free-running engine, which removed the weight of the engine from the drive axle and to the loose axle end, was a long step toward easier handling. The introduction of rail skids, set-off skids, and extension lift handles were also helpful. Too, both by more careful design and by the use of lightweight, high-strength alloys, the total weight of the car was reduced. Yet it must be said that weight reduction still remains one of the most desired changes in the car; it is the point on which the modern car is most criticised.

Some of these developments were influenced by the automotive industry. Among these may be noted improved carburetion, better engine design, and especially the application

Modern Track Cars Are Now Practically Indispensable to the Transportation and Effective Work of Section Gangs

of light-weight alloys to the construction of many parts. Of these changes, some followed closely the practices in automobile construction, being essentially the adoption of those practices with only such modifications as were necessary to adapt them to the peculiar requirements of

An Early Velocipede Car

the motor car. Many others were not in any sense copied from the larger industry, but suggested by its experience and studies. There is another way in which the influence of the automobile has been felt. To a considerable extent the inexperienced operator has disappeared; he may still be careless and indifferent, but nearly always he has had some experience with the gas engine, and some knowledge of it, through his acquaintance with the automobile engine.

Further developments are to be expected. Just what they will be is largely conjecture; probably a further reduction in weight, especially by the substitution of lighter and stronger materials for those now used, possibly the use of Diesel power in place of the gas engine, and perhaps more or less radical changes in general design.

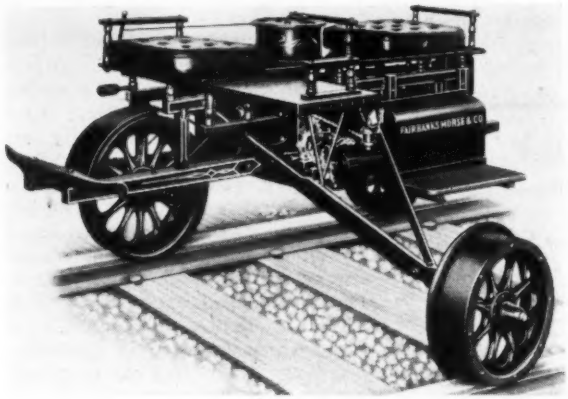
The Life of the Car

The cars of today are far superior to those of even 10 or 15 years ago. They are powered more adequately, yet without increase in weight. They are much more reliable and economical in operation and are more easily maintained. That they fully justify their use in maintenance of way work and the other services to which they are applicable is attested by the fact that approximately 52,000 of them are in use on the railroads at the present time. These 52,000 cars represent an investment of approximately $15,000,000. During 1944 it is estimated that more than 3,200 new cars were purchased at a cost in excess of $1,000,000.

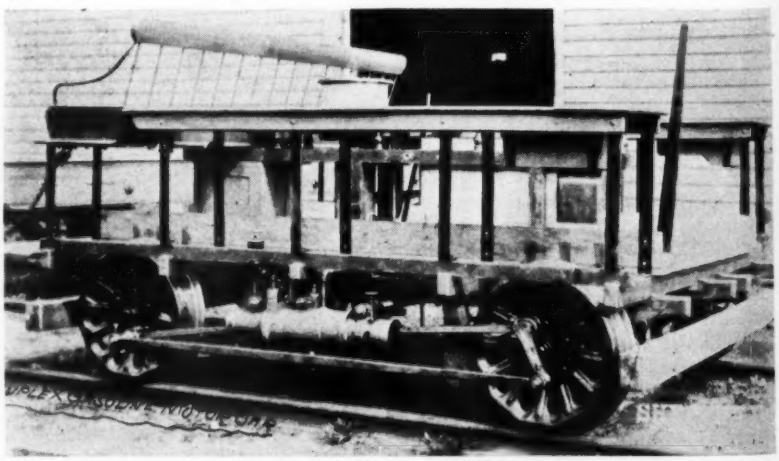
The number of motor cars purchased in a given period and the number in use at any time varies widely. During times of heavy traffic, maintenance work increases and there is an increase both in the number of cars in use, and in the number of cars purchased. During years of slack business there is some reduction in the number in use and, for obvious reasons, a reduction in the number purchased.

The average life of a motor car is generally considered to be about 10 years, although many cars remain in service much longer than that. Many things affect the life of a car; care in design and in the choice of materials, care in maintaining and operating, and, of course, the amount the car is used. Many cars still in service are 20 years old or older. In such cases, little if any of the original car remains; but by the renewal of parts the life of the car has been extended far beyond the average. Whether this is economical may be questioned for two reasons. The first of these is based on the service received from such an old car; there will always be some parts nearing the end of their life, and the failure of one such part may delay the work of a gang to such an extent as to more than offset any saving effected by delay in replacing the car. The second reason is based on obsolescence; while the changes in design from time to time, as has been noted, have not been radical, they have, even in a life span of 10 years, improved the service of the car to a marked degree.

Practices in the retirement and replacement of cars vary on different railroads. The advisability of the retirement of a car may be determined by comparing the estimated cost of repairing it with the cost of purchasing a new car to replace it. If the cost of the repairs amounts to as much as 60 per cent of the cost of a new car, the old one may well be retired. However, obsolescence should also be considered; if for example, the old car is direct-connected, its retirement on a lower per-



The First Complete Motor Car—A Light Inspection Car of the Side-Load Type



This Center-Load Gang Car, One of the First to Be Built, Was Propelled by Two Water-Cooled Engines, One on Each Side

centage would be warranted when the increased safety in the use of a car with free-running engine is considered. Again retirement on a lower percentage of the cost of replacement may be justified if the old car is the only one, or one of a very few, of that particular type on the property, or if it is of a type that has proved unduly expensive to maintain or hard to handle.

A Hand Car of Many Years Ago, Equipped with an Early Gasoline Engine

The Motor Car in Track Work

The tasks in the maintenance of way department in which motor cars are employed include almost every operation in the conduct of the work of maintaining tracks and structures. Their principal field is in track work, not only for regular section gangs engaged in the routine work of maintenance but also in extra-gang and construction service.

Formerly it was considered that the use of a motor car would save, for the foreman and men on the average section, an hour each day that would otherwise be spent in non-productive work. Owing to the lengthening of sections on many roads, this saving has been increased from 50 to 100 per cent in some territories. In fact, the use of the motor car may be considered a principal factor making the lengthening of sections possible. In addition, the efficiency of the men is increased by reason of the fact that practically no exertion is required of them in the operation of the car, and as a result their full energy is available for the work in hand. It is also possible to secure and hold a better class of men where motor cars are used. The motor car also permits a foreman to get over his track at more frequent intervals. Another advantage is the convenience and speed with which gangs may be mobilized at any time for emergency or other work. It is of decided advantage in enabling a gang to get to an accident or washout promptly. It is of particular value in permitting a gang to get over its track quickly after a storm, thus reducing delays to trains and the possibility of accidents.

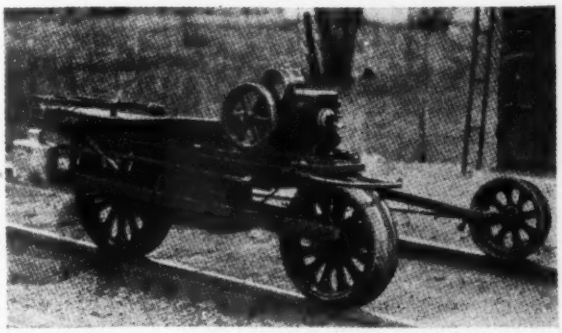
The use of motor cars is of particular value with extra gangs in handling both men and materials. This is especially true in handling men as it eliminates the necessity of sending them on regular trains whose schedules may not be adapted to the working hours, and delivers them to the job without an extra stop for the train. The use of motor cars also makes it possible in many cases to select more favorable camp sites. The time saved by extra gangs is generally greater than that with section gangs, both because of the longer haul and the greater number of men involved. It may often amount to 1½ to 2 hours daily for each man, as in the case of exceptionally long sections. On the basis of a 50-man gang, this would aggregate 75 to 100 man hours, or the equivalent of 9 to 12 additional men.

Heavy-duty motor cars are used by welding gangs for the transporting of men and materials to and from their work. They are also used for towing track weed mowers, and, with discing equipment attached, for discing ballast shoulders.

In connection with motor cars in gang service, the use of push cars* and trailer cars should be considered. The load that the motor car itself can carry is limited by both weight and space. However, a modern section-duty car with free-running engine is capable of towing a well-loaded push car, while a heavy-duty motor car may be expected to haul five or six trailers carrying as many as 100 men or more, or a number of push cars loaded with material.

Based on the number of motor cars used, signal maintenance comes next after track maintenance and each car in this service will make a considerably greater mileage per day than cars in section or extra-gang use. The maintenance of modern signals requires frequent and careful inspection and adjustment of signaling equipment. To do this without a motor car for the transportation of each maintainer and his tools and supplies would require double the number of maintainers now employed.

In bridge and building work, both light and heavy cars are required; the small cars for inspection service and light building repairs, and heavy-duty cars for handling the larger gangs, their tools, and frequently, materials as well. The distances traveled vary greatly but the service generally is comparable to that of the smaller extra gangs.



One of the First Small Gasoline Engines Installed on a Velocipede Car

A Modern One-Man Inspection Car

The use of motor cars in inspection service is practically universal. The cars used are confined largely to two classes; the one requiring a small car capable of carrying one or

*"Push car" as used here means a car designed and used for carrying materials, while "trailer car" or trailer is one equipped for transporting men; the American Railway Engineering Association so defines these terms.

two men and used in bridge inspection and by roadmasters and track supervisors; and the larger party inspection cars, the seating capacity of which varies from 6 to 16 persons, and which is designed for general use on divisions or grand divisions.

The Modern Section Car Can Haul Substantial Loads of Men and Materials

Division inspection cars usually have a seating capacity of 6 to 8 persons and are capable of transporting the division superintendent and his staff. General inspection trips over several divisions usually demand a larger car with additional seating capacity. These larger cars are equipped with engines of from 25 to 112 hp. and will attain speeds as high as 50 m.p.h. or more. In many instances they replace the division superintendent's business car or a special train, such as was frequently operated in the past for the purpose of making inspections.

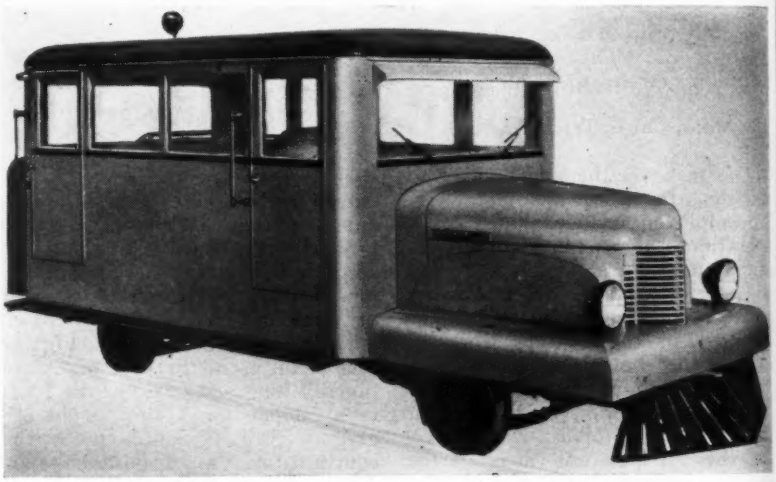
Besides their use as party inspection cars, there are other applications of the use of motor cars that are entirely apart from maintenance of way work. Motor cars are used for hauling employees to and from isolated shops and yards where other means of transportation are not available. They are also used by yard clerks in checking cars on outlying tracks, and by car repairmen for making repairs on bad order cars set out at outlying points. In some cases store departments use them for checking line stocks and for handling materials.

One of the problems in the operation of hump yards employing car riders is to return the car riders to the hump as quickly as possible. The motor car has proved to be the most satisfactory and economical method of performing this task. Heavy-duty cars are used in this class of service, equipped with foot boards in addition to the deck and seat used on roadway maintenance cars. These foot boards permit the riders to board the cars while in motion and also form a foot rest for men seated on the deck of the car. From 10 to 15 men ride the car on each trip. Without motor cars, the logical means of transporting the car riders would be through the use of a locomotive and trailer car. Therefore, the saving by using motor cars is equivalent to the cost of operating a locomotive from one to three shifts per day, depending upon the number of hours the hump is in operation.

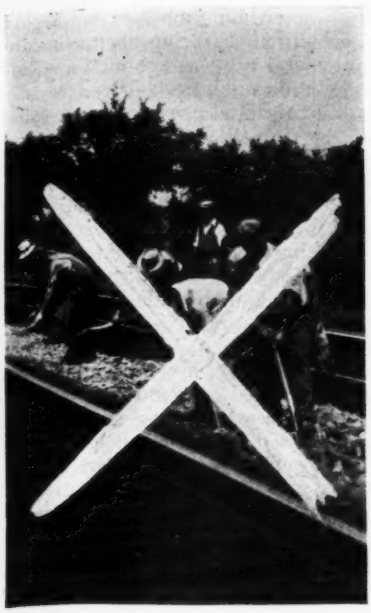
During recent years, the use of work trains for distributing roadway materials has been declining, and their use for transporting men to the job has almost entirely disappeared. The latter was always an expensive practice but until the advent of the motor car it was one that could not be avoided. Handling men by motor car has not only eliminated the work train expense, the daily cost of which has increased greatly in recent years, but in addition has in many cases reduced the time lost by the gang owing to the fact that the work train frequently spent much time in a siding clearing revenue trains, or was called late to avoid interference with traffic. Work trains are still used to a considerable extent for distributing materials, but even here, the use of heavy-duty motor cars towing push cars on which materials are loaded has saved many work-train days. Every work train taken off the road makes for efficiency. The motor car, more than any other agency, has made possible the reduction of work train mileage from an average of 42,910,932 miles per year in the period from 1911 to 1915 inclusive, to 15,530,660 miles per year in the five years from 1939 to 1943, inclusively, a reduction of 27,380,272 miles in the yearly average.

The future of the use of motor cars cannot be forecast with any certainty. New uses may be found for them, and in other cases they may be supplanted by other methods of handling men and materials. Especially during times of heavy traffic, travel by motor car is sometimes delayed considerably. In line with the general movement toward the use of off-track instead of on-track equipment, there has been some development in the use of auto-trucks. This trend may be expected to increase where conditions are favorable, and for certain services for which the use of trucks is peculiarly adapted. It may be noted, however, that off-track transportation can be used only where improved highways are adjacent or give ready access to the railroad; and that the purpose of patrolling track is not served by off-track transportation. This latter feature is of particular importance in the case of track forces; and its loss would undoubtedly demand some specific patrolling to replace that now done as the gangs move to and from their work. The duties of signal and communication lines forces are also in general such as to require that they travel on the track.

In spite of possible delays in their operation, and the occasional loss of a car in an accident, there is little doubt that motor cars will continue to be used on the railroads in large numbers for many years.



An Up-to-Date Large Party Inspection Car



Where Economies Will Result Hand Labor Must Give Way to Machines

Future Needs And Possibilities In Work Equipment

Sees broader field of use for present machines, and wide need for further progress by roads and manufacturers

By A. E. PERLMAN

Chief Engineer, Denver & Rio Grande Western

Denver, Colorado

THE MOST striking savings in the use of work equipment by the railroads during the last ten years have come from the substitution of off-track equipment for conventional rail-bound machines. The New Haven, a decade ago, faced with serious delays to its maintenance gangs traveling over high-density traffic lines, pioneered in the use of highway motor vehicles for the transportation of its gangs to and from work. At about the same time, the Wheeling & Lake Erie inaugurated the use of small draglines in the conduct of its ditching operations. Both of these innovations gave excellent results, and two years later the Rio Grande began an extensive program looking toward the adoption, wherever possible, of off-track equipment. In fact, the substitution of an $85,000 investment in off-track equipment on this road for its old conventional equipment, which was scrapped, permitted a reduction in work-train expense alone, during the first year's use of the new equipment, of $220,000; and an analysis of unit costs shows a total saving of three-quarters of a million dollars annually.

Today, a number of the railroads that have pioneered in the use of off-track equipment are finding, in spite of the increased traffic density now being borne, that their manpower situation is less acute, that many traffic delays have been avoided, and that many operations, now deemed impractical with the old conventional machines, can be carried on without impediment from war-born exigencies. Also, traffic interruptions due to emergencies are being brought under control much more quickly with consequent aid to the war effort.

The needs of our armed forces have rapidly accelerated the adoption of new techniques. With the experience they are gaining in the rapid rehabilitation of the railroads over the entire globe, and the new equipment which they are developing to meet new situations as they arise, many possibilities unfold themselves to the construction and maintenance officers of the railroads. This is indeed fortunate, because with a growing dearth of man-power and greatly increased unit costs for labor, the mechanization of all possible operations is needed as never before.

Three Functions of Equipment

In railway engineering and maintenance operations, adequate work equipment is necessary to perform three distinct functions: (1) The construction of new facilities, (2) the maintenance of existing facilities, and (3) the speedy rehabilitation of facilities destroyed or damaged through acts of God or other causes.

Work falling within the first category can be programmed well in advance and no premium need be placed on mobility or on weight of the equipment used especially in large construction projects. In the second category, work can also be programmed well in advance of the starting date, but the equipment used must take into consideration the necessary factor of doing the work with as little delay to traffic as possible—or with as little possible delay from traffic. In the third category, the scope and magnitude of the work cannot be anticipated and speed is of the essense.

The use of equipment in the first two categories of operations which readily lends itself to utilization in emergencies is of the utmost importance. This discussion will center, therefore, about the possibilities of the use of work equipment on a representative Class I road of average traffic density, under average conditions, and will place emphasis upon those types of equipment which will permit full utilization under the varied types of operations mentioned.

Highway Vehicles

To eliminate as far as possible delays caused by traffic and to increase the speed and safety of movement of workers, transportation of these workers to and from their work, wherever consistent, should be provided for in adequate highway vehicles equipped to handle tools and small supplies necessary for the day's work. Section gangs, bridge

and building gangs, signal gangs, extra gangs, welding gangs, scale inspectors, water service mechanics, work equipment repairmen and engineering parties should have vehicles built and equipped especially for the services to be performed. They should be equipped with the necessary types of racks and tool trays, making them, in effect, traveling tool houses or work shops. In addition, each bridge and building truck should be equipped with a power winch and "A" frame for lifting heavy materials, as well as an hydraulic lift gate for loading and unloading purposes. These vehicles should also be equipped with such mechanical tools as large and small saws, power drills, a bolting machine, a water pump, and a concrete mixer.

The trucks furnished water service and work equipment mechanics should be equipped with a small generator for welding and for the operation of small power tools. Vehicles used for track gangs should be equipped with all of the necessary hand and power tools for such gangs. Trucks used by scale inspectors should be equipped with the necessary test weights and tools required in testing and adjusting scales. All such vehicles should be equipped with comfortable seats and with adequate heating and ventilating devices, and should be provided with proper racks or other means of transporting tools and materials safely.

Motorized gangs can operate effectively within a radius of 50 miles, so that with the conventional spacing of terminals, headquarters for the bulk of the gangs can be located at those points where housing accommodations, mechanized shop facilities, and a ready labor market are found to be adequate. Furthermore, camp cars, with their attendant costs for maintenance, transportation and handling of supplies, can, to a large extent, be eliminated, and a better type of worker, living at home, can be recruited. During emergencies, such forces can be mobilized quickly and transported to the points affected.

Off-Track Grading Equipment

Draglines, shovels, bulldozers, carryalls, scrapers and front-end loaders, which have combined to revolutionize dirt-moving operations, thus making possible the construction of line changes heretofore not deemed economically feasible, will be used more extensively in the future than ever before in maintenance operations and in the rehabilitation of lines temporarily out of service due to acts of God. Much has already been written concerning these machines, but it is impossible to over-emphasize their great usefulness; for when not in use on heavy construction projects, they can be so equipped as to be used effectively during the entire remainder of the year in ditching, riprapping, grading, bank widening, trenching, loading stock-car bedding sand, loading and unloading coal and other materials, and handling ice and snow. On railroads which have adopted these machines extensively, they are generally used so intensively that it has been found difficult to find time to permit them to be placed in the shop for overhauling. And regardless of the number of machines in use, so many varied needs are fulfilled by them that it is a rare occasion when one can be found idle.

Can Attack Any Place

A special feature of these machines is that, in case of emergency, it is not necessary to open up the line from the two ends, because these machines can attack the work at many places and with much greater facility than machines which must be operated on the rails. A bulldozer equipped with a winch can clear a derailment either by moving boxcars which block the main track or by building a shoo-fly around the obstruction. Damage due to washins and wash-outs can be quickly obliterated with this equipment, so that a bulldozer, equipped with a winch, takes its place with the large wrecking derrick as a *must* for emergency uses.

An additional advantage of this equipment is the fact that it need not be tied up waiting emergency use, but can be used during the entire year in routine work, and then transported quickly to any point where an emergency arises. With the trend toward the curtailment of local freight service, in the face of the need for means for the speedy transport of equipment to care for emergency requirements, trucks and trailers to move off-track equipment by highway are desirable.

While rail-laying operations have been mechanized to the point where they resemble a factory production line, with bolting machines, spike pullers, adzers, rail layers, and spike drivers to implement the work, the same cannot be said of ballasting operations, for while many machines have been perfected for this class of work, including the power jack, the track shifter, the tie placer, the power ballaster, the power tamper, and the cribbing machine, no highly mechanized surfacing operations are in general use throughout the country. Additional study given to this problem should prove of great value to the railroad industry for the surfacing of track out-of-face absorbs a very substantial proportion of the roadway budget. Due to the large number of man-hours required in surfacing track by present methods, full mechanization of this work would open up a fertile field for both the railways and the manufacturers of equipment.

In bridge and building operations, shops located at strategic points to handle the pre-framing of materials, to be assembled in the field, will increase quality and decrease production costs. With adequate modern shop machinery, a more economical job can be done and the field work then becomes merely an assembly job for gangs properly equipped with power tools. Many roads already pre-frame bridge timbers before treatment, and the operations above mentioned would thus supplement such operations, for all other materials could as readily be prefabricated.

Lighter Compressors

With the present rapid development of the internal combustion engine—including Diesels of a cubic yard in size developing 1,000 hp.—and the newer developments in metallurgy, engines with greater horsepower per pound and per cubic foot will soon be available for all types of work. This will be of special advantage in maintenance operations where maneuverability and portability are of prime importance. Manufacturers of air compressors, in particular, can take advantage of these developments, because at present every additional 20 lb. added to the air capacity of the machine requires an increase of hundreds of pounds in weight, making the compressors used by extra gangs particularly cumbersome. The trend toward crawler mountings for this type of machine will be accelerated in the future, and the self-contained tamper, now too heavy for continuous operation, will be decreased in weight. In considering maneuverability in other types of machines, the front-end loader and the overhead loader should be designed with the same speeds in both directions for the more rapid and economical ditching of long, narrow cuts.

With a sharp increase in rates of pay and a decreasing labor supply, it is now necessary, as never before, to mechanize completely every possi-

ble operation in the construction and maintenance of way and structures. To secure the greatest use from the machines purchased, they should be designed for all-year use, and for as many purposes as practicable.

The competitive conditions in the field of new construction long ago made necessary revolutionary changes in dirt-handling equipment. Diesel-powered, crawler-mounted machines, for example, have aided materially in roadway maintenance operations. As yet, however, no pile driver has been developed which is fully satisfactory for all conditions imposed by new construction, routine maintenance and emergency work. The pile driver in general use today is a large cumbersome machine, good for only one purpose. Marked improvements can be made through the design of a land driver, mounted on crawler treads and equipped with an air-operated hammer, which could be used as a crane, dragline or shovel when not in use as a pile driver.

At present there are machines of this type, equipped with swinging leads, but for the heavy work required in railroad construction, especially the driving of batter piles, they have not proved as satisfactory as the track driver used almost universally in maintenance work. Land drivers with the desired characteristics would be of great benefit in emergency operations, because with them it would not be necessary to wait until track is built to a washed out portion of the line to begin construction of a temporary bridge. Furthermore, such work could be carried on simultaneously at many points in case of a major catastrophe. In ordinary maintenance operations, they could be used with greatly decreased interference from traffic, and with consequent economies of a substantial nature.

Other Equipment Needed

An efficient off-track rail layer will greatly facilitate operations and increase the output of rail-laying gangs, making it unnecessary to run to sidings to clear for trains when laying rail under traffic. Several such machines are on the market at present, but many improvements are still possible. Since this type machine is one of the most important in use on the railroads today, a full study of its further possibilities is one of the "must" items before the industry.

On lines with high traffic density and heavy grades, the fouling of ballast and consequent impairment of signal circuits by sand and head-end cinders give rise to the need for a machine which will remove such foreign matter from the ballast. A cleaner which could successfully sweep and load stack ashes and sand on grades and in tunnels—and which could be used to clean up yards—would greatly reduce present labor costs. Hundreds of thousands of man-hours are consumed annually in manual operations of this nature on mountain railroads. Suction-, scraper-, and brush-equipped machines have been used in experimental trials, but as yet there is no machine on the market, within a popular price range, to perform this function. Much thought has been expended by railroad men on this problem, because ballast not only becomes fouled in mountain territory due to the accumulation of head-end cinders, but the same problem arises on prairie roads, due to dust and sand storms which cause foreign matter to be bown into the ballast.

Other Possible Developments

Sub-grade and foundation conditions are being studied more intensively than ever before, and the railroads are purchasing equipment for foundation explorations to assure themselves that bridges built many years ago, for which complete foundation plans are not available, are resting on material that will withstand unusual water conditions. Complete foundation explorations are also being made before the construction of new bridges or other important structures to assure proper foundation plans. A drill used for this purpose, which could also be used in testing slide areas and for exploring for available water supplies, could be used to good advantage during the entire year. Many core drills on the market can be used for exploration work, but there still remains a fertile field of study for a machine which will fit the universal needs of the railroads.

Sub-grade soil investigations have opened up a new field for equipment manufacturers, particularly in the design of equipment for use in the pressure grouting of the sub-grade to eliminate water pockets. Tools to facilitate the jacking of drainage pipe through fills are also increasing the efficiency of these operations, so that new techniques for increasing the permanence of the roadbed are constantly being opened up to the railroad engineer.

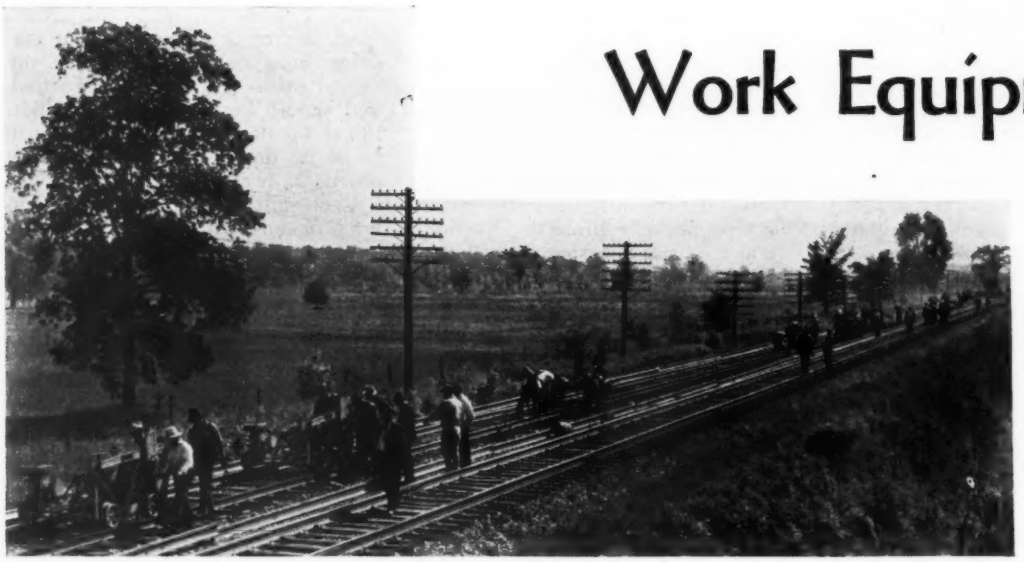
Off-track mowing machines have proved of great value, for their use is possible far beyond the range of the track mower. They can be used over the entire right-of-way, to care for station grounds, and to cut vegetation about structures and at many other places impossible to reach from the track. However, the machines now on the market are designed primarily as a farmer's tool, and should be equipped with additional appliances for cutting brush to insure their maximum utilization on the railways.

Each railroad has its own particular problems, which, due to physical and traffic conditions, place greater emphasis upon certain functions than would be the case on other railroads, thus requiring special equipment which might not be justified under other conditions. For example, it has been found that three man-days are required to clean a double-deck stock car in the winter when the material is frozen in the car. Western railroads handling large numbers of stock cars in the winter could, therefore, well afford to mechanize this operation, while other roads originating very little livestock traffic would not find it profitable to purchase the equipment required.

If our railroads are to gain the full benefits which can accrue from the use of modern equipment, the imagination of our men must be worked overtime, and accurate unit costs must be made available to them. Fifteen years ago, the head of a large contracting organization told the writer that detailed unit costs were kept on every machine used in their work. As a result, he pointed out, six months after the purchase of a new concrete mixer, it was replaced with a more modern machine, because it was found that the difference in the cost of doing the work with the two machines did not permit the retention of the older type machine. This made a lasting impression on a railroad officer who was accustomed to using a machine until it was in such condition it could no longer be repaired.

One of the difficulties confronting maintenance officers in attempting to justify new types of equipment to their managements is the fact that many of them have no detailed costs upon which to base their recommendations. If such costs could be obtained from other roads on which these machines are in use, and if each railroad involved had accurate unit costs covering its own operations, many of our railroads would today be equipped with more modern machinery. This seems obvious. It is inconceivable that with modern crawler-type machines available which will return their purchase price within two months, steam ditchers, used in conjunction with a work train, are still in evidence on our American railroads.

Work Equipment



Work Equipment Needs Must Be Met If Essential Maintenance Work Is Not to Suffer

W.P.B. Not Too Optimistic

IN contrast with the optimistic feeling that prevailed in both government and civilian circles only a few months ago when many foresaw the early fall of Germany and a consequent easing of the material and equipment situation on the home front, the War Production Board now looks for a continuation of heavy military requirements until the war in Europe is definitely over, and, in fact, for some time following V-E* day, with the result that it sees little possibility of an early easing of present equipment controls. Thus, in spite of the fact that the year 1944 saw substantial improvement in a number of factors governing the procurement by the railways of needed work equipment, inquiries made recently of the Transportation Equipment Division of the War Production Board indicate that it is not too optimistic concerning the year ahead. The Board believes, however, that the railways will be able to obtain a large part of the work equipment that will be essential to their requirements during 1945, except in a few specific types.

At the present time, there is a critical shortage in crawler-type draglines and a shortage to some extent in most other types of crawler-mounted equipment. These shortages have become more pronounced in recent months because of changing war requirements, and also because of the need for such equipment for rehabilitation work in liberated areas. In fact, the arrival of V-E day is not expected to ease the situation appreciably for these types of equipment, because of the demands that will be made by new invasions in the war against Japan and by enlarged programs of rehabilitation work in Europe.

In general, the situation as regards certain other types of work equipment, and especially those designed specifically for maintenance of way work, is not tight, and most of these types are being furnished to the railways more or less in the quantities desired and on the schedules required. However, it is pointed out that even as these statements are being written, there are indications that the shortage of steel for war purposes will necessarily curtail the manufacture of equipment generally. The Transportation Equipment Division is definitely confronted with this situation, but expresses the hope that the manufacturer of that equipment most urgently needed for railroad maintenance will not be reduced as much as the production of equipment for less essential needs.

Copper, of course, is still tight, a situation that is reflected in all products for civilian requirements, and, to no small extent, in the availability of such materials and equipment as wiring, electric motors and some engine parts for roadway machines and power tools. Fortunately, however, many types of maintenance of way work equipment and tools require the use of a relatively small amount of copper.

The War Production Board is well aware of the increased need for work equipment to offset the critical shortage of maintenance labor, a shortage which has been particularly noticeable on the southern railroads, which have heretofore been able to rely on a plentiful labor supply. In fact, it is anticipated that little or no improvement can be expected in the man-power situation generally on the railways, and that, as a result, the need for additional units of maintenance of way work equipment will continue to show an increase for at least the duration of the war.

Those in the Transportation Equipment Division of the W.P.B. emphasize that the procurement of work equipment by the railways can be greatly facilitated if the roads will anticipate their requirements early and will place their orders well in advance of the time the equipment is needed. This, they say, is being done as a rule, and has enabled the Board to meet more fully the demands made upon it. This, they also point out, helps manufacturing schedules to keep pace with the demand.

No Changes in Rules

Broadly speaking, the system of materials control and distribution developed by the W.P.B. has proved satisfactory and is functioning smoothly. Therefore, no further changes are contemplated in this system, and any changes, if found necessary, will, undoubtedly, be minor. Thus, a continuation of the present modified form of the Controlled Materials Plan is expected to remain in

*Victory in Europe

Deliveries in 1945—
What Are the Prospects?

Round-up of opinion in W.P.B. and among builders indicates that situation is still tight, but that roads can expect to secure essential requirements

effect. Under this plan, most maintenance of way work equipment is now given an AA-3 rating, which usually suffices to insure reasonably prompt deliveries. In cases of urgent unforeseen needs, in which equipment may be required for emergency use, a directive is usually issued which requires the manufacturer to make and deliver the items as soon as possible. In other cases, an AA-1 rating may be granted for equipment which cannot be secured promptly on an AA-3 rating.

Any belief to the contrary, it is still necessary for railroads submitting applications for authority to purchase work equipment to cite convincing reasons for its need, and to point out the manner in which the equipment will be used to solve specific war-time maintenance problems. Regardless, requests are not always granted, and the Board frequently recommends the use of alternate sources of supply or of alternate types of equipment, if they will accomplish the purpose, and especially if the alternate types of equipment are more readily available or involve the use of less critical materials. In such cases, the railroad must accept the alternate type of equipment or convince the Board that the original request is essential, showing reasons why the substitute suggested will not serve the purpose for which it is intended.

In brief, the railroads in 1945 will be allowed what they need in work equipment, after military requirements have been met. W.P.B. does not anticipate any lessening of military requirements for some time, and thus expects that present conditions regarding the procurement of work equipment will continue, without much change, throughout at least a large part of the year.

Manufacturers Doing Their Best

TO railway engineering and maintenance officers in need of power tools and machines to carry out their essential programs of work, the ability of the equipment manufacturers or builders to meet their needs, is, in some respects, as important as the influence of the War Production Board in its necessary limiting or restricting orders. Are the railway equipment manufacturers still interested in the railway market? Have they plant capacity to handle railroad requirements, over and above other requirements? What is the status of their production schedules with respect to filling railway orders? To what extent are shortages in labor likely to interfere with production? On the answers to any of these questions may well depend the prospects of the railways to secure needed power tools and machines in 1945.

To secure answers to these questions, inquiry was made of a number of representative manufacturers, all of whom have served the railway field in the past, and some exclusively. They were asked if they were actively interested in and soliciting railway business; the condition of their delivery schedules; the reasons for any delays in making deliveries; the ways in which railway officers can help them to improve deliveries; and the prospects for more prompt deliveries in the months immediately ahead and after the collapse of Germany.

To the harried maintenance man, desperately in need of every available means to enable him to carry out large essential work programs, and especially in the face of new military demands on materials and a still further deteriorating labor situation, the answers received are not as reassuring as he would like to hear, with the possible exception of those to question No. 1—Are the manufacturers still interested in railway orders? Answers to this question, however, should convince him beyond doubt that he is not forgotten, and that, war orders to the contrary, the manufacturers have a keen understanding and appreciation of railway problems, and are anxious to lend a hand in the solution of these problems to the maximum extent possible.

What Are 1945 Needs?

But before considering the ability of the manufacturers to meet the needs of the railways for power tools and machines, what are the needs of the railways for such equipment in 1945? One of the best answers to this question is to be found in the record of the recent past.

In 1944, in spite of restrictions which curtailed many orders, the railways purchased more than 10,000 power tools and machines, a volume never before equalled, and almost 1500 units more than the previous record purchases of approximately 8,500 units in 1943. Is it possible that, confronted with another record-breaking year of war traffic—another year of unprecedented programs of roadway and structures maintenance to keep in step with this traffic, and faced with a shortage of labor that promises to be more severe than at any time during the war to date—combined with the severe wear and tear on the present equipment due to intensive use and unavoidable abuse in the hands of

inexperienced operators—that the railways can get along satisfactorily with smaller purchases of work equipment in 1945? Considered from any standpoint, the answer to this question is a decided "no."

As pointed out in another article in this issue, based upon information secured from the chief engineering and maintenance officers of a number of roads, the maintenance of way forces desire to purchase at least as many units of power tools and machines in 1945 as in 1944, and would, unquestionably, contemplate still larger purchases if there were reasonable prospects that their orders could be filled. Record essential programs of work on most roads in the months ahead, in the face of a certain severe shortage of labor, the reduced experience and productivity of available labor, and the inadequate supply of many essential track materials, the effect of which must be overcome by routine maintenance operations—all demand that the maintenance forces be permitted to secure these power tools and machines, either to replace worn out units or to supplement present equipment inadequate to meet demands. In fact, many maintenance officers, convinced that more power tools and machines are the only answer to their heavy programs, plan to press for their needs in 1945 more aggressively than they have in any of the war years to date.

Can Manufacturers Meet Needs?

Will the manufacturers be able to meet these demands? If based alone upon their desires and interest in the railway field, there would be no question as to the answer in this regard, as every manufacturer questioned indicated that he is keenly interested in the railway market, and only 4 out of 26 indicated that, because of military and other related demands, they are not actively soliciting orders in the railway field at the present time. Even three of these four indicated that they are endeavoring to fill those railway orders that do come in. All of the other manufacturers showed the greatest solicitude for the problems of the maintenance forces and indicated their desire to meet their needs to the fullest extent possible.

But beyond this desire to be of service—of assurance of co-operation—there are other important factors that will influence the ability of the manufacturers to supply railway needs. First of these is the size of the continuing demands of the Army, the Navy, the Maritime Commission, Lend-Lease, and many vital war industries for essential power tools and machines. Another is the availability of the necessary materials required in tool and machine construction. A third is the plant capacity of the manufacturer. A fourth is the availability to the manufacturer of adequate labor. And still another is the size and character of the railway requirements themselves.

Remembering all too clearly the temporary, though serious, setback of the Allied forces on the Western front during the latter half of December, 1944, and the subsequent, still-persistent cry of the military forces for largely increased supplies of ammunition, equipment and materials, many of the manufacturers see no letup in the demands on their plants for military purposes, while others are already experiencing heavier demands, or look for a tighter situation with respect to those materials necessary for them to continue present schedules. In addition, a few manufacturers are already experiencing an added drain on their facilities occasioned by the efforts of the government to send materials and equipment to fill the basic needs of liberated countries or areas, a new demand, which some expect may increase to the point where it will offset, to some extent at least, any reduction in future military requirements. Furthermore, while not concerned about increased demands upon their facilities or about further restrictions on materials, a number of manufacturers, already short of manpower in some of their plants or departments, show increased concern about the effects of the recently stepped up program of military inductions and of other manpower controls now in effect or under consideration.

Some Find Conditions Better

But having pointed out the foregoing concerns, the worst from the standpoint of the manufacturers has been said, because a majority of those questioned find the situation at present no worse than 12 months ago, and at least a few of them find conditions better. In fact, there is rather unanimity of opinion that, aided by the continually more satisfactory operation of the Controlled Materials Plan, the advantages inherent under W.P.B. order P-142 relating to materials and equipment procurement for railway maintenance and operation, and other measures taken by the various divisions of the War Production Board in the interest of more equitable distribution and simplified practices, the material situation as a whole, at the moment, is considerably improved. On the other hand, many of those questioned are quite seriously concerned about the prospects for enlarged military requirements for materials, which may cut their allowances for railway needs, and a number of them complain of serious and growing difficulties in securing electric motors, small gasoline engines, motor and engine parts, bearings, cable and both malleable and steel castings, indicating a continuing tightness in these products. Still others attributed much of their difficulties in making early deliveries to the inability of other suppliers, upon whom they must rely, to fill their needs for specialized equipment.

Summarizing their answers as to the prospects of being able to fill railroad orders during 1945, six manufacturers of a total of 21 answering this question, stated that they expect conditions to improve as far as they are concerned—one because of added plant facilities during the year; five manufacturers see conditions remaining the same for some time, while nine indicated that they expect conditions, in some respects, to become worse. Among these latter manufacturers, two make no qualifying comments; three do not expect the situation to become at all serious; one lays his problems primarily to labor conditions; while the other three look for a less favorable condition only for the next five or six months, with better prospects late in the year.

Railway Men Can Help

Asked specifically concerning the ways in which railways can assist them in their production problems, and in making early deliveries, a number of manufacturers indicated that railway men are doing everything possible and are co-operating with them 100 per cent. Others indicated the importance of the railways following closely the procedures set up by the War Production Board in seeking to secure their needs; the importance of securing suitably high priorities, where priorities are required, to insure early consideration; the importance of establishing the essentiality of their needs clearly and beyond question; the importance of anticipating their requirements and of placing their orders far in advance of actual needs; and the importance of co-operating with manufacturers to the fullest extent in accepting standard or available models, with minimum specialties, in some cases even to the color of paint. Indicative of the importance attached to the early anticipation of needs and placing of orders for equipment, is the fact that no less than half of the manufacturers questioned emphasize this point, indicating that there is still room for substantial improvement on the part of some railway officers who specify equipment and originate orders.

Work Equipment Battles Snow

(Continued from page 274)

These conditions in the vicinity of Buffalo seriously affected traffic on the main lines of the New York Central; the Erie; the Delaware, Lackawanna & Western; the Lehigh Valley; the Wabash; the Nickel Plate; and the Pere Marquette, all of which roads terminate at or pass through this area. Traffic was also affected on important lines of the Pennsylvania, the Baltimore & Ohio and the Canadian National. Thus, the flow of a large proportion of the nation's war-time, as well as essential civilian, traffic was seriously reduced.

Clearing the Yards

It was an uphill struggle to get the yards cleared of cars and snow after the January blizzard. In some cases, two switchers were used to loosen one or two cars at a time, and frequently cars were derailed—some so badly that they could not be rerailed without the use of a wrecker. Many of the cars had to be worked back and forth until they would roll freely before they could be humped and classified, and even then some would stall and have to be pulled in the clear by the "trimmer" engines. In some cases, cars were dug out by hand with picks and shovels. When an entire track was clear of cars, bulldozers, Jordan spreaders, snow plows or other available equipment was used to clean the track of snow and ice. As several tracks were cleared, the accumulated snow and ice was piled over onto each third or fourth track by the spreaders and bulldozers. This snow was then loaded onto cars or into trucks to be hauled away and unloaded, and thus provide room for more snow if additional storms should come. Locomotive and crawler cranes, equipped with clamshell buckets, and tractors equipped with front-end loaders, were used for much of this snow disposal work.

Most of the important switches in main lines, in yard lead tracks and at interlockings were equipped with switch heaters. These had to be serviced with fuel, but they saved thousands of man-hours of labor. Other switches had to be cleaned by hand as necessary, and with oil from snow melting cans. Trucks equipped with plows were used in many places, particularly around driveways and passenger platforms. In addition to the railroad work equipment, much contractor's equipment was rented, including trucks, bulldozers, etc. In fact, everything available that could be of use was pressed into service.

To ease the situation, all freight routed through Buffalo was assembled into solid trains and was operated through the Buffalo area without switching. Also, some freight was diverted via more southerly routes, and some via Canadian roads. In addition, during two critical periods, the Office of Defense Transportation authorized, first, a three-day, and later a four-day embargo.

Main Lines Kept Open

As the accumulation of snow piled higher and higher, it became increasingly difficult to keep main lines open. In many of the deeper cuts, drifts as high as the stacks on the locomotives were common. During the storms, snow plows were frequently operated ahead of trains or fleet of trains. Commenting on this, one maintenance man said, "sometimes the first train would get through and the second would get stuck." In one case, a snow plow pushed by two locomotives was stalled on a main line, and not infrequently snow plows operated by only one locomotive were unable to break through, especially on branch lines.

The eastbound track of one double-track road near Buffalo was blocked for several days, and all trains were operated over the other track. However, all other main tracks and many of the most important branch lines on this road were kept open. This was accomplished only by the continuous operation of rotary snow plows, snow plows of the double-track wing type, and single-track plows. Most of the Jordan spreaders used were of the composite type, specially equipped for snow-plow work, with cutting teeth on the lower edge of the plow for breaking or loosening the ice and packed snow in the track.

On one double-track line, the prevailing winds caused such bad drifts over the eastbound main track that reverse plowing with two plows was finally resorted to. With this system, one plow was used to throw the snow from the eastbound track over onto the westbound track, and the second plow, operating on the westbound track, plowed the snow off to the side that was not drifting.

Man-Power Shortage

Added labor, as can well be appreciated, was very hard to secure, and the main burden of the snow fighting, therefore, fell upon the regular maintenance forces. This was particularly true at Buffalo, where about 74 industries were taking practically all available labor ahead of the railroads. Faced with this situation, all methods of securing additional help were tried, no matter how remote the possibilities. Some men were hired through labor agents; advertisements were published in the newspapers; appeals were broadcast over the radio; and applications were made to the War Manpower Commission.

Considerable help was secured from soldiers and sailors, both from camps and on furlough. In addition, most roads in western New York were helped, after February 1, by the National Guard, which was called out by Governor Dewey when the fuel situation in many localities began to get critical.

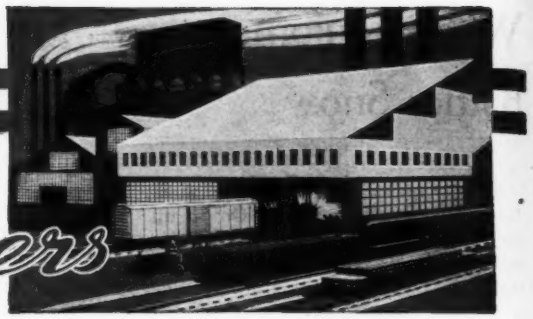
New England Blizzard

While the New England railroads had had considerable snow, the storms were widely spaced and, in general, had not been accompanied by the high winds and drifting conditions experienced in western New York. As a consequence, they reported operations "entirely normal" on January 30. This situation lasted until February 8, when a blizzard from the Atlantic hit the seaboard and blanketed the coast, and 50 miles inland, from Connecticut to Maine, with from 4 to 16 in. of snow. This snow was accompanied by high winds and, in the Boston area, which was particularly hard hit, 16 in. of snow fell with drifts ranging up to 15 ft. This was a wet heavy snow, which in some cases froze to a diameter of three inches on overhead wires, causing numerous communication and power failures.

Fortunately, this blizzard was a one-time affair, and the wet snow did not melt and then freeze before it could be cleared. The New Haven reported operations about normal 24 hr. after the snow, except in the vicinity of Boston, which required another 24 hr. to achieve general recovery. The Boston & Maine was harder hit, since the area of heavy snowfall extended for some distance north and west of Boston. This road "hired every available man or high school boy" to help the regular forces, and also appealed to the Army, Navy and Coast Guard for help. Much the same methods and equipment described previously were used by the New England roads to remove the snow. In addition, a Fox snow-loader and steam melting tank* were reported as "of great help" on the Boston & Maine, where they were used in the hump yard and on other yard tracks at Boston, as well as at the road's North Station passenger terminal.

*Described in detail in December, 1944, *Railway Engineering and Maintenance*, pages 1137-38.

PRODUCTS of Manufacturers



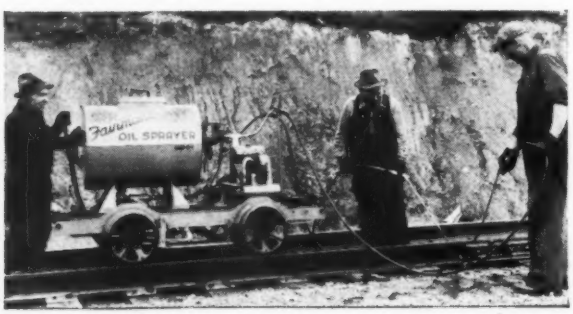
Oil Spray Car

FAIRMONT Railway Motors, Inc., Fairmont, Minn., has introduced a new oil-spray car, known as Model W61, which is designed for applying heated oil under pressure to angle bars and other track and switch accessories. The machine is mounted on four flanged wheels and embodies a single-cylinder, four-cycle, air-cooled engine with a V-belt drive to a rotary, gear-type pump. The pump, with a mechanical seal, pumps hot oil from a 70-gal. storage tank to two hoses, each of which is provided with a hand valve and an atomizing spray nozzle. The oil is delivered at the rate of 5 gal. per min. under a maximum pressure of 225 lb. per sq. in.

Among the features of the engine are an oil bath air cleaner, magneto ignition and a clutch in the power take-off. A special oil-resistant synthetic material, reinforced with braid, is used for the two spray hoses. For highest efficiency, the hand spray valves are made of aluminum, bronze and stainless steel, and two types of atomizing spray nozzles, flat and full cone, are furnished with each unit.

The pump and oil lines are so arranged that they can be used for transferring oil from drums to the storage tank mounted on the car. Four filters are provided to assure clean oil and positive operation of all parts with minimum wear. To assure more rapid penetration of the preservative oil, means are provided for heating it with the engine exhaust. It is said that under average conditions three men using the oil spray car can cover a mile of track an hour, using approximately 10 gal. of oil.

Other features of the spray car include rail skids, brakes on the rear wheels, four insulated, demountable wheels, double-row axle bearings, one differential axle, a draw bar at each end and a coupler link.



The Model W61 Fairmont Oil Sprayer

Improved F-M Push Car

A NUMBER of improvements have been incorporated in a new heavy-duty push car, known as Model 111-C, that is now being manufactured by Fairbanks, Morse & Company, Chicago, including a through-type draw bar, a lifting eye in the center of the car, and stake pockets at the four corners of the frame.

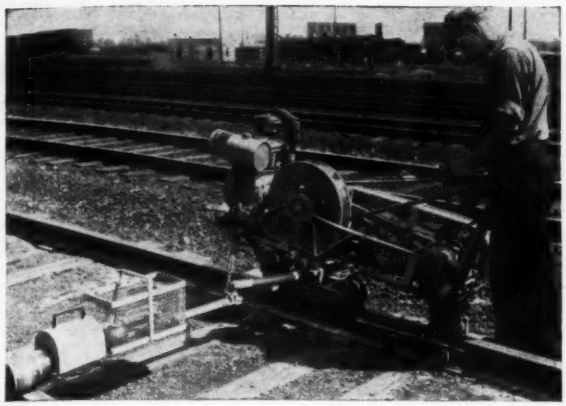
The New Model 111-C Heavy Duty F-M Push Car

The car frame is constructed of welded steel channels, which are deeper and heavier than those in this company's Model 111-B push car, with both the side sills and cross sills being in the same horizontal plane. This is accomplished by dropping the cross sills down between the side sills, providing opportunity for more and better welding than with Model 111-B, in which the cross sills are mounted on top of the side sills, and at the same time, it is said, eliminating any tendency for the cross sills to tip or turn over.

The new car is standard with 16-in. cast-iron wheels with chilled treads, mounted on a 52-in. wheelbase, and all four wheels are of loose design. They are fitted on 3-in. axles made of high-carbon, heat-treated steel, which are machined to a diameter of 1-11/16 in. at the ends. Thrust collars are provided on the axles at all four wheels to hold them to gage. Plain sleeve-type babbitt bearings are used on the car. The rated capacity of the car is 25,000 lb.

Nordberg Power Wrench

A NEW model power wrench for use in connection with rail laying and joint maintenance work has been developed by the Nordberg Manufacturing Company, Milwaukee, Wis. Designated as Model DW, the wrench is powered by a 3½-hp., air-cooled gasoline engine that drives the sockets by means of a bevel friction arrangement on the engine shaft, which engages one of the two faces of a reverse bevel friction wheel, rotating it in the desired direction. Two socket speeds are used, a high of 122 r.p.m. for running loose nuts on or off, and a low speed of 35 r.p.m. for starting "frozen" nuts and for bringing nuts up to final tightness. A convenient hand lever is provided to change from



The Nordberg Model DW Wrench in Operation

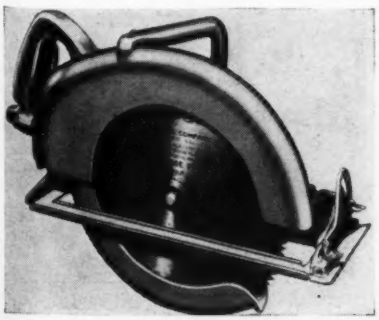
one speed to the other, and another lever changes the direction of rotation of the sockets.

An overload release is provided to disengage the operator's lever and cut off the power to the sockets when the proper bolt tension is attained. The release is governed by spring tension which, it is said, can be quickly and easily adjusted to secure the desired bolt tension. It is claimed that the torque produced by the machine at a given setting will not vary more than five per cent.

The new wrench may also be adapted to the driving of screw spikes by means of an accessory that is provided for use with it. When this is used, the overload release functions in the regular manner, preventing damage to the wood fibers from over driving. It is said that the wrench can be easily removed from the track by two men, since it can be separated into three units, the wrench mechanism, the carriage and the stabilizer.

New Air-Powered Portable Circular Saw

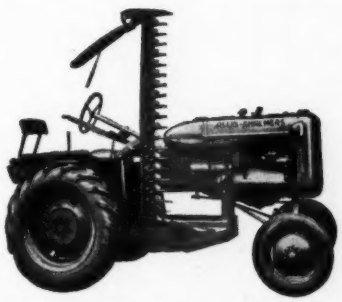
DESIGNATED as Model P-128, a new portable pneumatic circular saw has been introduced by the Mall Tool Company, Chicago, which is powered for cutting heavy timbers, and which is said to be especially advantageous for use on bridge and building work. It is equipped with a 12-in. blade which has a free speed of 1400 r.p.m. The saw has a cutting capacity of 4½ in. on straight cuts and is capable of making cuts on angles up to 45 deg. It has a telescopic safety guard, and an observation glass permits the operator to watch the cutting line, which is kept clear at all times by air from the motor exhaust. The saw can also be furnished with special blades or cut-off wheels for cutting concrete, sheet aluminum, terrazzo or tile.



The New Mall Hand-Held Circular Saw

All-Purpose Mower

AN all-purpose mower has recently been developed by the Allis-Chalmers Manufacturing Company, Milwaukee, Wis., which has a variety of travel speeds and is said to have unusual stability for operation on steep slopes and difficult angles. Mounted as a unit on a Model "B" Allis-Chalmers tractor, the mower has a 5-ft. heavy-duty cutter bar, which is in full view of the operator and which is raised and lowered by means of a hydraulic power lift. The arrangement of the sickle is such as to permit a full cutting stroke from a position 45 deg. below the horizontal to 60 deg. above. In addition, the sickle has a belt-drive slippage to provide safety relief when obstructions are accidentally encountered. The mower design is such as to enable the tractor to pull gang-mowers or other equipment without the necessity of removing the cutter bar.



The Allis-Chalmers Mower

Side Handle Electric Drills

THE Independent Pneumatic Tool Company, Chicago, has announced a new line of Thor "armored in plastic" portable electric drills, which is featured by the fact that the handles are on the sides of the units. Except for this feature, the new drills are identical in construction to the original "armored in plastic" pistol-grip machines. The new models weigh 3½ lb. each, are 7 9/16 in. long and are available in three speeds, namely, 2500 r.p.m., 3750 r.p.m. and 5,000 r.p.m.

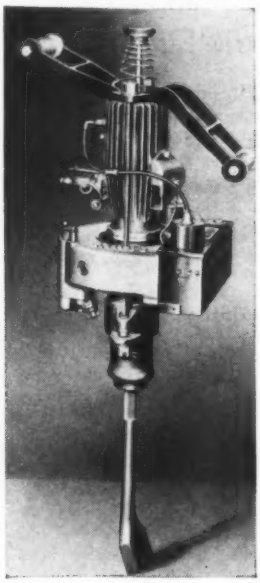
The New Thor "Armored in Plastic" Side-Handle Electric Drill

Improved Tie Tamper

THE Barco Manufacturing Company, Chicago, has developed a new tie tamper, known as the Model TT-3 Tytamper, which is offered as a substantial improvement over this company's Model TT-2 Tytamper. The new model is said to retain all of the advantageous features of the earlier unit, with the addition of certain improvements. The principal change is the simplification of the ignition system and its inclusion as an integral part of the tamper, the battery (dry cells) and coil being mounted on the side of the gas tank. This is in contrast to Model TT-2, in which the battery and coil are contained in a box attached to the tool by wires.

To improve the ignition system, an automotive-type timer is used, which reduces the drain on the dry cells to such an extent that they will last for a normal week of heavy work and several weeks of intermittent work.

If desired, it is also possible to use wet batteries and cables with the Model TT-3 Tytamper. It is believed that the inclusion of the battery and coil on the gas tank of the new model will simplify tamping operations in con-



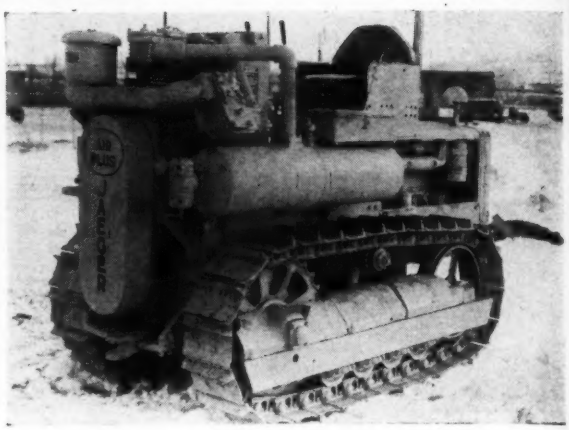
The Barco Model TT-3 Tytamper.

gested areas, and that the improvement will be equally appreciated in areas where traffic density is not a major consideration. The new tamper is said to be somewhat lighter in weight than Model TT-2.

Tractor-Mounted Air Compressor

THE Caterpillar Tractor Company, Peoria, Ill., has added an air compressor-tractor unit to its line of off-track railroad maintenance and construction equipment. The machine is composed of a Jaeger three-cylinder, two-stage compressor mounted on a Caterpillar Diesel D4 tractor. The compressor is air-cooled and has an intercooler between the low-pressure and high-pressure stages. It has a capacity of 160 cu. ft. per min. at 100 lb. pressure, and is driven by the Diesel engine of the tractor through a rear power take-off. The tractor is the standard D4, with the exception that the controls and operator's seat have been relocated.

This unit is said to be especially adapted to roadbed grouting work, and to be advantageous for such other compressed-air work as repairing, cleaning and spray-painting bridges, and for operating tie-tamping and ice-breaking tools, and pneumatic drills, hammers, etc.

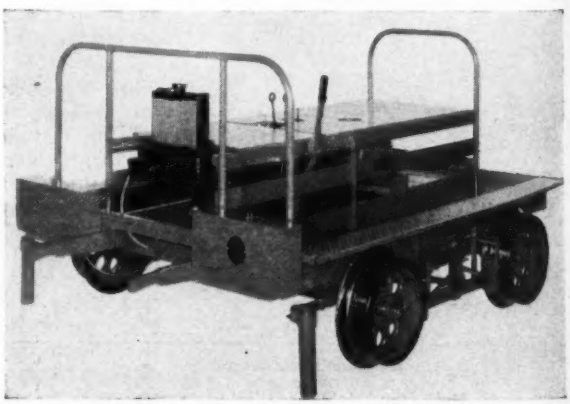


The Machine Consists of a Jaeger Compressor Mounted on a Caterpillar D4 Tractor

Another feature of the unit is the fact that the tractor drawbar is available for pulling other equipment and general drawbar work. In addition, a bulldozer can be added to the machine as auxiliary equipment for use in filling ditches, and for building access roads and equipment emplacement areas on side-hill locations.

Section Motor Car

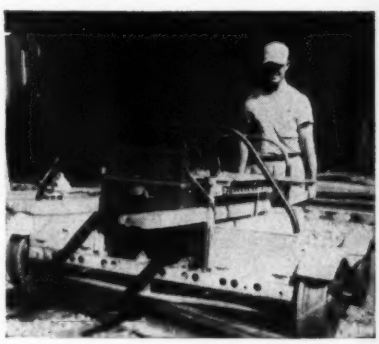
FAIRBANKS, Morse & Co., Chicago, has developed a new light-weight section motor car, designated as Model 55-C, for use in branch line service by small section gangs. This car, it is said, can conveniently seat up to six men but can be handled safely by one man. The car body, the running gear and the dimensions of the new car are the same as this company's Model 85 section motor car. The frame is of wood, well braced with light steel reinforcement, has tubular steel safety rails, front and rear, and is mounted on 14-in. wood-center wheels having 3½-in. treads. The car is powered by a single-cylinder water-cooled 9-hp. engine equipped with a steam condenser and a 7¾-in. clutch. The timer and throttle controls are mounted on the engine. In addition, the car has a one-piece removable seat, steel tray ends, side-outlet exhaust made of flexible tubing, and raised pattern, non-slip toe boards.



The New Model 55-C Motor Car

Front-End Skid for Inspection Cars

A FRONT-END skid for its 1-2 man and 1-4 man inspection cars has been developed by Fairmont Railway Motors, Inc., Fairmont, Minn. The



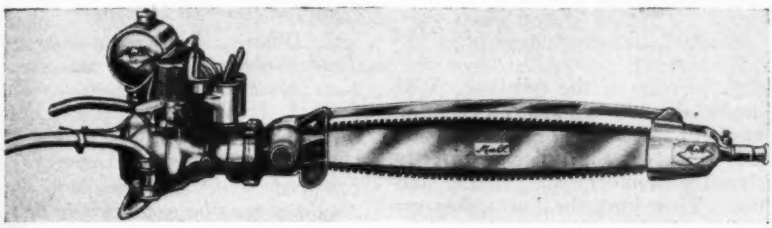
Showing How the Skid Assists the Operator When Handling Car to or From Track

skid is a simple, light-weight unit made of steel tubing and has a vertical center support. It can be applied

to all current Fairmont inspection cars, either as new cars at the factory or those already in service. Field applications are said to require only the drilling of one small hole in the front cross member of the frame. The skid is said to be especially beneficial where it is necessary to remove or re-rail cars between set-offs or grade crossings, particularly if the track rail is relatively high.

Mall Chain Saws

THE Mall Tool Company, Chicago, has introduced a new line of gasoline-engine-driven chain saws embodying models having capacities of 24 in., 36 in., 48 in., 60 in. and 72 in., which are said to have several special features, including an automatic clutch that prevents the stalling of the engine when the saw is pinched or forced too hard, and the fact that the operator manipulates the engine throttle only when he is ready to begin sawing.



One of the New Mall Gasoline-Engine-Driven Chain Saws

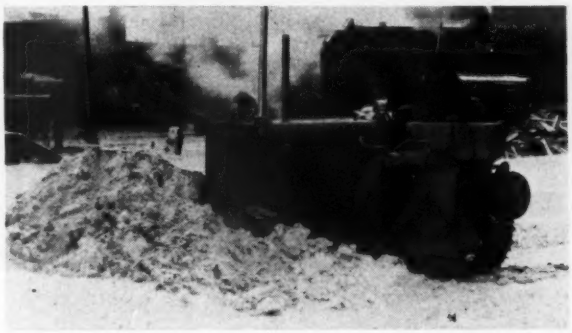
The saws are each powered by a two-cycle, two-cylinder, six-horsepower engine. Features of the engine include aluminum alloy pistons and cylinders, forged-steel crankshaft and connecting rods, a plain tube-type carburetor with a special float feed, air and fuel filters, a flywheel fan-cooling system, an idler, a rope starter and an automatic centrifugal clutch. Control of the saw chain, which is hand-lubricated, is centered in the automatic clutch, while the chain tension is adjusted by turning the handle grip on the idler at the opposite end from the engine.

Unusual Method of Snow Removal

An unusual method of handling snow was recently used on the Chicago & North Western at its Wood Street potato yard, Sixteenth street and Western avenue, Chicago, where a Caterpillar D4 tractor was employed in combination with a LaPlant-Choate trailbuilder and a LaPlant-Choate C-45 Carrimor scraper to remove snow from the driveways between tracks. This scraper has a capacity of 3 cu. yd. struck and 3½ cu. yd. when the material carried is heaped.

The operation consisted of using the trailbuilder to pile the snow in windrows along the center of those driveways being used. When this work was completed the scraper was coupled to the tractor and used to haul the snow away. To prevent excessive wear on the cutting edges of the trailbuilder and the scraper the blades were held a distance of 1 in. to 1½ in. above the pavement.

It was discovered that the condition of the snow had considerable effect on the speed of operation and the amount of snow carried per load. With well-packed snow containing some moisture the operator could pick up about 4 cu. yd. per load, while with very wet and heavy snow he could take as much as 5 cu. yd. per trip. Experience on this job indicated that if the snow is loose and dry it may be allowed to stand in windrows, if conditions will permit, until it becomes well-packed and moistened, after which it can be picked up with the scraper.



The Snow Was First Piled in Windrows with the Trailbuilder

During a particular period on this job the total time cycle for one complete trip of the scraper, including the loading, hauling, dumping and return operations, was observed to require about 3½ min. About 18 sec. were required to load the scraper. In this period the snow was damp and was well-packed in windrows about 8 ft. wide and 1½ ft. deep, and the loads averaged 4 cu. yd. per 500-ft. haul. On the basis of these figures, and using a 50 min. hour, the machine would make 14.3 trips per hour. At 4 cu. yd. per trip it would handle about 57 cu. yd. of snow per hour, or a total of 456 cu. yd. in an 8-hr. day. Since dumping space at this location was limited, the haul distance was subject to change, amounting to as much as 1,500 to 1,800 ft.

The equipment mentioned in this article was purchased primarily for use in connection with the maintenance of cut ditches and waterways, the improvement of the roadbed and general earth-moving work. The handling of snow constitutes an additional application that will help to make it possible to keep the equipment in operation on various maintenance tasks the year around.

Removing the Snow with the Carrimor Scraper

What's the ANSWER?

Spike Holes in Tie Plates

Should the spike holes in double-shouldered tie plates be flush with the shoulders, or should they be slightly inside? Slightly outside? Why? How much?

Should Be Outside

By Engineer of Track Design

Before answering the question raised it seems desirable to make some preliminary remarks on the track structure. In my opinion it is essential that the tie plate be rigidly fastened to the tie, and that provision be made in line spikes or rail fastening to make it possible for the wave motion of the rail to take place without pumping the tie or moving the tie plate. When this is done all of the wear and abrasion is between two steel surfaces, the bottom of the rail and the top of the tie plate, and this is as it should be, rather than between steel and wood. To help secure this condition, the line spikes should be so driven that the heads clear the rail flange about 3/16 in. Also, the spike holes in the tie plates should be so located that the face of the spike does not contact the edge of the rail base.

If the spike is driven down so that the head contacts the rail base, the wave action of the rail will raise the spike in a short time. This initial lifting of the spike destroys the major portion of the holding power of the wood. After this, when the spike contacts the rail base, the wave motion of the rail acts in the same manner as a ratchet, resulting in the continued raising of the spike.

It is my opinion that the best location of the line spike holes in double-shoulder tie plates is slightly outside of the faces of the shoulders, probably about 1/16 in., which would be sufficient, considering tolerances, to insure that the spike would not contact the edge of the rail base. With double-shoulder tie plates there is no need for the spike to take any of the side thrust of the rail base directly, since the shoulders perform this function. Therefore, the line spikes can well be placed so that they do not contact the rail.

Wants Them Slightly Outside

By G. M. Magee
Research Engineer, Association of American Railroads, Chicago

I do not believe that we are now using the most desirable arrangement of spike holes in tie plates. It may be, however, that practical considerations will preclude adopting the plan which my observations have convinced me is the most desirable. It is my opinion that the spike holes should be punched in such a manner as to leave ⅛ in. of metal between the spike hole and the edge of the tie plate shoulder on both the inside and the outside of the rail.

I am aware that there are objections to this practice. For one thing, some difficulty may be encountered in punching the plate to avoid a bulge at the shoulder, and there is some doubt as to whether this objection could be overcome. In addition, some engineers will also think it undesirable to permit the free lateral movement of the rail on the tie plate to the extent permitted by the difference in the widths of the rail seat and the rail base that is required for rolling tolerances. Another objection is that a longer head would doubtless be required on the spike.

Send your answers to any of the questions to the What's the Answer Editor. He will welcome also any questions you wish to have discussed.

To Be Answered in May

1. *When cleaning shoulder ballast, under what conditions is it desirable also to clean the ballast in the cribs? How can this best be done?*

2. *What are the advantages and disadvantages of precast and cast-in-place concrete curbs for station platforms? What considerations affect their use?*

3. *Where section gangs are equipped with spot tampers, how should a gang be organized if tie renewals are made in connection with the spot surfacing? What are the advantages?*

4. *To what extent and in what ways can slow orders be eliminated or the maximum speed under such orders be increased when making repairs to open-deck trestles? To ballast-deck trestles? To steel spans?*

5. *What are the relative merits of single and double-acting track jacks for general surfacing? For section work? Why?*

6. *What procedure should be followed in starting a reciprocating steam pump that is submerged? Why?*

7. *What methods should be followed to educate the maintenance forces to salvage usable material? Who should do this?*

8. *What precautions against fire should be taken when using gas welding and cutting equipment in buildings? On bridges? How effective are they?*

However, recognizing all of these difficulties, it seems to me that the advantages in having the rail base bear only against the tie plate shoulder and not against the spike, thereby reducing the notching of the rail base and throat wear on the spikes, are such as to justify giving serious consideration to this method of locating the spike holes.

Should Be Flush

MAJOR J. DE N. MACOMB
Assistant to Vice-President, Inland Steel Company, Chicago

Spike holes in double-shoulder tie plates should be flush with the faces of the shoulders. With the spike holes in this location, the sides of the rail base press against the shoulders without the "throat-cutting" of the spikes which would result if the spike holes extended inside the face of the shoulders. To punch the spike holes with the near edge a short distance outside the face of the shoulder would be very difficult without distorting the shoulder.

Spike holes in tie plates are punched from the bottom of the tie plate toward the top. For this reason, because of "draw," the spike hole is larger at the top than at the bottom. Hence, the bottom of the spike hole determines its position. Because of the "draw," if the edge of the bottom of the spike hole is on the line of the face of the shoulder, the top of the spike hole will extend a small fraction of an inch inside the face of the shoulder.

No Benefit Either Way

By W. H. SPARKS
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

Double-shoulder tie plates are designed to fit the base of the rail so closely as to have a holding or binding action on the rail if the tie should shift the least bit, thereby acting somewhat in the nature of anchors. Tie plates of this type are the best yet to be brought forward. One advantage is that they help to keep the ties from slewing around, as they were apt to do with single-shoulder tie plates, resulting in the throat-cutting of the spikes.

In view of these considerations I cannot see any benefit in placing the spike holes slightly inside or slightly outside the shoulders of double-shoulder tie plates. If the spike holes are placed inside the faces of the shoulders they would be forced to take the side thrust of the rail, thereby raising the possibility of their becoming throat-cut almost to the same extent as with single-shoulder tie plates. With the spike holes flush with the shoulders, the latter do their part in holding the rails in place and the spikes are free to perform their primary function which is to hold the rails to the ties and to gage.

Neither do I see any need for placing the spike holes slightly outside the face of the shoulder. If this is done an undue amount of strain will be placed on that part of the spike head extending over the rail base.

Small Division Carpenter Shop

What are the advantages of a small carpenter shop at division headquarters? What work can be done effectively in such a shop? What tools and equipment should be provided? Are there disadvantages?

Has Many Benefits

By H. J. WECCHEIDER
Division Engineer, Erie, Jersey City, N. J.

There are numerous advantages in having a small carpenter shop at division headquarters, although its success is dependent on careful planning of the work and on the character of the supervision provided. Proper supervision is all the more necessary under present conditions when the conservation of man-hours and material is an imperative need. Preferably, the shop should be located in the vicinity of the headquarters of the master carpenter so that he will be able to supervise the work personally and plan the operations to secure maximum efficiency.

The size of the shop and the equipment to be provided are dependent on the size of the division and the work to be done. It may be designed and equipped to handle only small miscellaneous jobs, or, if desired, it may be on a larger scale, permitting heavier work to be done and pre-fabricated units to be built. The pre-fabrication of items that were formerly built in the field at each separate site will result in definite economies in the use of both man-power and materials, particularly in cases where more than one unit is to be built. Buildings of various types can be fabricated in the shop, knocked down if necessary, painted and transported to the site for erection. Prefabricated buildings can be constructed in the shop in possibly half the time that would be required to do the work at the site, and when this is done erection in the field becomes a simple matter.

Summarizing the advantages of a division carpenter shop, it can safely be said that work can be accomplished more quickly and efficiently at less cost. It is a well-known fact that more efficient work can be done by men who work together continuously at the same shop with tools they are accustomed to handle. Also, when the work is done in a shop under ideal conditions, it can be performed much more safely, since many hazards ordinarily inherent in out-door work are eliminated. One of the most common causes of waste in labor is the time consumed in traveling to and from the site of the work. Work done in the shop eliminates this loss, with a consequent lowering of unit costs. Furthermore, time lost due to inclement weather is eliminated entirely. Another advantage is that a high degree of standardization can be achieved when the work is done in a shop.

The ability to keep a carpenter force employed steadily day after day on actual production is certain to pay dividends. Moreover, where the working conditions are ideal, as they are likely to be in a shop, a better class of workman is attracted. Also, it is possible to employ the older and more experienced carpenters in the shop while the younger and more active men are used in the field. The advantages of a carpenter shop are all the more noticeable where trucks are available for transporting the finished units to the site of installation.

The type of carpenter work that can readily and profitably be done in a division shop includes the construction or repair of such items as doors and window sash, window and door screens, storm windows and doors, partitions, shelving, cabinets, bins, coal and tool boxes, mole conveyors, office furniture, level and spot boards, crossing gates, standard crossing and roadway signs, tool houses for guards and crossing watchmen, panels for concrete forms, and many other items.

In the construction or repair of larger buildings the pre-cutting of various members at the shop will result in the saving of considerable time, will produce more accurate cuts, and thereby effect definite savings in the material used. Rafters and studding fall in this category, and even roof trusses can be completely built in the

shop. Where the size of the trusses is such as to make it impracticable to move them to the job in assembled form, they can be dismantled in part as necessary.

To promote efficiency in the operation of a carpenter shop, it should be designed, constructed and equipped in accordance with the needs of the particular location. The shop should have a bench-type radial saw, a band saw, a combination bench saw and jointer, a mortising machine, a wood boring machine, several small electric hand saws and drills, a portable electric plane, sanders, a grindstone, and a paint-spraying outfit. Care should be exercised to arrange the work benches and equipment to eliminate any unnecessary steps on the part of the workmen.

No Disadvantages

By T. H. Strate
Division Engineer, Chicago, Milwaukee, St. Paul & Pacific, Chicago

There are only benefits, and no disadvantages, in having a small carpenter shop at division headquarters. At any terminal point of any size there is always a considerable amount of carpenter work of a more or less special nature to be done, such as the building of window sash, doors, office furniture, money drawers, etc. Much is to be gained by performing such work in a shop and transporting the items to the place of installation, thereby saving the time of carpenters that would otherwise be lost in traveling to and from the job, and also avoiding the handling of loose material.

The carpenter shop should be equipped with a drill press, a bench saw, a power grinder and other necessary wood-working tools and equipment. In addition, there should be available at the same location a paint shop where signs can be painted and where miscellaneous jobs can be handled which need not be sent to a larger shop.

It is possible that on a terminal such as that of the Milwaukee at Chicago we have more calls for help from the general offices than would be the case at an outlying division point, but in any event I believe that the chief carpenter is considerably handicapped if he does not have a shop at his headquarters where carpenter work can be done to much better advantage than if the various jobs were scattered over the territory.

Waterproofing Concrete Surfaces

Can waterproofing be applied with equal success to new and old concrete surfaces? If not, why? Do the methods of application differ? Why?

Must Consider Condition

By M. Hirschthal
Concrete Engineer, Delaware, Lackawanna and Western, Hoboken, N.J.

No unequivocal answer can be made to the question as to whether waterproofing can be applied with equal success to new and old concrete without knowing the condition of the "old" concrete to which it is to be applied. If the old concrete is as good as new there is no question about the answer. However, when the question arises as to the advisability or necessity of waterproofing old concrete, it is because the old concrete has given evidence of requiring such treatment by showing leakage, spalling, or deterioration in other forms. If this deterioration has not proceeded to such an extent as to "soften" the concrete to the point where it is in a "rotted" condition, the waterproofing can be applied, and, if properly installed, will prevent further softening and deterioration.

The advantage of waterproofing new concrete construction lies not only in preventing the destructive action of "outside" water, but in precluding the loss of "inside" water by permitting retention of the water used in mixing the concrete for the continuing hydration of the cement content, a process that goes on for a considerable time after the concrete has "set." Evidence of this process is the "thirst" of new concrete for water. For this reason it is the writer's opinion that there should be no substitute for water curing for at least 24 hrs. and preferably 48 hrs. before any other accepted form of curing, such as a sealing coat, is applied to the concrete surface.

With the exception noted above, old concrete may be waterproofed just as readily as new concrete. In doing this work the usual precautions apply, namely, the surface of the concrete must be made perfectly clean and as smooth as possible, drainage must be provided to carry off the water, and the application of flashing around openings and up the sides of vertical intersecting surfaces must be carried out with care, especially in bending the membrane. Also, the concrete surface to which the waterproofing is to be applied must be dry.

Whether a priming coat is to be used will depend upon the school of thought to which the engineer-designer belongs. If he is furnishing the waterproofing as a trough to retain the water, and carries the trough high enough to preclude the possibility of the water overflowing it, no priming coat is necessary. However, particularly in the case of concrete that has been in service for some time, it would be best to seal it positively against the entrance of water by the use of a priming coat of emulsified asphalt, preferably followed by a second coat of the same material (sometimes fibrated) before the application of asphalt-saturated open mesh fabric in at least two layers. To protect the waterproofing from being punctured, a protection coat of mastic block or plank, or concrete reinforced with mesh, should be provided, with a mopping of asphalt over the final surface. If blocks or planks are applied, the joints should be filled with asphalt or a mixture of asphalt and sand.

This, of course, is the same type of protection afforded new concrete and it should, if carefully applied, protect the concrete from the action of water to the same extent and with the same satisfaction as a similar coating applied over new concrete.

With Complete Success

By M. A. Cronin
President, Knickerbocker Roofing & Paving Company, Chicago

It is assumed that the question refers to membrane waterproofing consisting of laminations of saturated felts or fabrics, or a combination of the two materials, applied to the concrete with a bituminous compound such as coal tar, pitch or asphalt. We usually think of membrane waterproofing as being used in connection with track elevation work, on bridge decks, on concrete slab floors in overpasses or underpasses, and on sub-level foundations, floors and sidewalls. Our experience on structures of these types indicates that the waterproofing membrane can be applied to old concrete with complete success if the surface to be treated is in sufficiently good condition (or can be properly repaired) to receive the waterproofing treatment, and if the structure is strong enough to withstand the impacts and stresses to which it may be subjected.

After any necessary repairs are made to the concrete, the surfaces to be treated should be thoroughly cleaned and all dust and fine dirt carefully removed so that perfect adhesion between the concrete and the membrane waterproofing can be obtained. The priming of the surface with a good bituminous concrete primer before applying the membrane is necessary to insure a good bond between the concrete and the waterproofing.

Retaining walls and abutments may be treated in a like manner if desired. However, it should be recalled that retaining walls are not generally waterproofed with complete membranes unless they are subjected to a considerable head of water. The most frequent treatment that is applied to retaining walls is called damp proofing. This generally consists of the application of a primer to the wall surface, followed by mopped or brushed coats of bituminous compounds of varying consistencies.

The methods to be employed in applying waterproofing membranes to old concrete surfaces differ little from those used with new concrete, provided the surface is properly repaired and is dry.

Maintenance of Pipe Lines

Does the type of pump in service affect the maintenance of pipe lines? Its condition? If so, how?

Under Certain Conditions

By C. R. KNOWLES
Superintendent Water Service (Retired), Illinois Central, Chicago

The type of pump used will have an effect on the maintenance of pipe lines under certain conditions. Centrifugal or rotary pumps will have little effect on the pipe line, provided that the line is properly designed for the service and not subjected to excessive pressure. A centrifugal pump will build up the pressure gradually without producing surges that might affect the pipe line, either when starting or when the pump is in full operation. Pumps of this type cause the water in the pipe line to start more slowly than with a positive displacement pump, gradually building up the pressure until the column of water is in full motion.

A rotary pump, being of the positive displacement type, will start the column of water in full motion as soon as operation begins, but will not create surges after the water has started to flow. With either centrifugal or rotary pumps, the sudden opening and closing of valves in the discharge line will result in surges that may cause water hammer and result in damage to the pipe line.

Reciprocating or plunger-type pumps may cause damage to the pipe lines and joints, particularly if the discharge line is a long one, unless precautionary measures are taken to lessen the shock when starting the pump or to minimize the effects of the surges inherent in pumps of this type. To this end it is customary to install air chambers in the discharge line immediately ahead of the pump to absorb the shocks due to the pulsations. With long pipe lines, a by-pass may be inserted between the discharge and the suction. By leaving the by-pass open when the pump is started, and gradually closing it, the column of water may be started slowly thus avoiding excessive pressure. Relief valves are also used for this purpose to good effect.

With reciprocating pumps the principal danger to pipe lines arises from missing valves, broken valve springs, or any other defects that might prevent one or more cylinders from becoming filled, resulting in irregular pulsations. These set up unusual strains in the pipe line that may have a bearing on the work of maintaining it.

Depends on Pump Design

By A. B. PIERCE
Engineer Water Supply, Southern, Washington, D.C.

Pipe line maintenance is reduced by pumps that are designed to deliver water without pulsations. Reciprocating, single-cylinder, single-acting pumps produce intermittent shocks in the discharge line, which occur as the result of the reversal of the piston. Fewer pulsations in the line are produced by duplex, double-acting, reciprocating piston pumps, with the result that there is less difficulty with leaking joints in the discharge and suction lines. The extent of the pulsations created in the pipe line can be readily noted by observing the pressure gage installed near the pump.

The air chambers that are furnished with most steam pumps are helpful in reducing water hammer and in taking up the shock in the pipe lines. When requested, relief valves are furnished with reciprocating pumps, and these are also helpful in reducing pulsations and water hammer. All types of pumps that are operated by a regular pumper should be relieved of air, when necessary, before they are started, to prevent the building up of pressure in the pump and pipe lines.

In my opinion, the centrifugal pump produces the least damage to pipe lines, this being due to the fact that the water is forced through the pipe lines without pulsations. This may be confirmed by observing the pressure gage on the discharge line, which will show practically no fluctuation. Such pumps produce no appreciable vibration in the discharge line.

Pump Design Not Important

By J. P. HANLEY
Water Service Inspector, Illinois Central System, Chicago

It is frequently assumed by water service men that centrifugal pumps are more conducive to favorable maintenance conditions in discharge pipe lines than are reciprocating or pulsating pumps. This assumption is based on the fact that centrifugal pumps produce a more uniform flow of water with less surging and water hammer. However, this factor has not been stated in terms of cost figures for pipe-line maintenance, and is not considered of sufficient importance to be included in comparative estimates for pipe-line maintenance. These omissions indicate that the view in favor of the centrifugal pump may be merely an opinion without the support of practical evidence. The centrifugal pump is now superseding those of the reciprocating type, with the result that pipe-line conditions should show gradual improvement, providing it is a fact that such pumps are less damaging to pipe lines.

The expenses incurred in maintaining pipe lines result more frequently from joint troubles than the type of pump or pipe employed. For a suction pipe the screwed or welded joint is preferred, while cast-iron pipe with poured lead joints is usually preferred for discharge lines. Cast iron is more resistant to soil corrosion although more joint calking and maintenance may be involved than with the welded or screwed type of pipe.

If pipe lines are laid carefully, with good jointing, and adequate measures are taken to prevent damage by settlement and surface vibration, the type of pump that is used becomes a matter of small importance. Under such conditions the pipe lines should handle the discharge from either centrifugal or reciprocating pumps with favorable maintenance results.

Soft Spots in the Roadbed

What is the best time of year for treating soft spots in the roadbed? Why? Does this differ for different methods of treatment?

It Depends

By W. H. Sparks
General Track Inspector, Chesapeake & Ohio, Russell, Ky.

It is universally known among practical track men that soft spots in the roadbed are found most easily during the winter, especially if the weather should be wet and changeable. Regardless of the season such spots should be corrected at the time they are found, either temporarily or permanently.

In these days of heavy traffic it may be desirable to make temporary repairs at the time the difficulty is first located, with the intention of doing a more lasting job when the weather improves. This is especially true if the soft spots are large and if permanent corrective measures will entail considerable digging work under the track. Also, if the work is done during dry weather there will be less likelihood of settlement occurring after the repairs have been made.

Another advantage in doing such work during dry weather is that it will entail less hazard to traffic than if it were done during the winter season or other times when there is apt to be more water in the roadbed, resulting in a generally unstable condition. It is also true that more and better work will be done when the weather is dry and pleasant.

At present most railroads have at least some weak spots in their roadbeds, and if the ballast and subsoil at such locations should become frozen, possibly resulting in the spreading of the track, a hazardous situation may be created. For this reason they should be given prompt attention even though the repairs may be only temporary.

Dry Season Is Best

By General Roadmaster

The first step, when the treatment of a soft spot is under consideration, is to make a thorough investigation of the troublesome location to determine the cause of the difficulty. If it is found that the soft spot is due to an unstable condition of the natural ground, such as would be encountered in swampy territory or in a peat bog, the best time of year to endeavor to correct the trouble would, of course, be at the driest season when the ground water is at its lowest level. Drainage is one way of curing such spots, assuming that the terrain is such that the ground water level can be lowered by the construction of surface ditches. If drainage is impracticable, it might be feasible, with the aid of a crawler-type dragline, to excavate the soft material down to a firmer soil and then backfill with a fine sand or a gravelly material, thereby providing a better foundation for the roadbed. If neither of these methods is found feasible a third possibility would be to drive piling into the soft ground at frequent intervals to hold it in place.

If the unstable nature of the roadbed is due to the fact that it is composed of clay or gumbo, a different approach to the problem is required. Roadbeds of this type are known to develop ballast pockets which, as they become deeper and grow in size, may eventually cause a splitting of the roadbed. Such pockets hold moisture and obviously do not support the track properly. While these soft spots are entirely different from those caused by unstable ground, it is none the less true that the best time to treat them is during the dry season, it being especially important to do the work at a time when there is no frost in the ground.

One way of treating soft spots of the latter type is to tear out the roadbed completely, rebuilding it with a more stable soil, preferably using sand or a gravelly material if it is available. Another possibility is to drain the ballast pockets by tapping them. This method requires that borings be made into the roadbed to locate the lowest parts of the ballast pockets in order to obtain good drainage, and is not too dependable. Still another method of treating these spots is to dig out the material from the pocket, using it to raise and flatten the roadbed slopes, and then to backfill the excavated areas and crown the top of the roadbed with a sand lift. Finally, the injection of concrete grout under pressure into the troublesome ballast pockets will tend to solidify them and prevent the entrance of further moisture into the roadbed.

Releasing Company Cars

What practical arrangements can be made to insure that consignees will receive advance notice of the arrival of company material, to avoid delays in the release of the cars?

Must Send Bill of Lading

By Malcolm E. Condon
General Yard Foreman, Erie, Croxton, N.J.

Under present conditions, when the prompt unloading of cars and company material is so imperative, it is necessary, when shipping to a railroad consignee, to forward to the latter a copy of the bill of lading or similar shipping notice on the same day the car is loaded. This is true regardless of whether the material originates at the plant or warehouse of an outside manufacturer or from some storehouse or other point on the railroad. When practicable, information regarding the shipment can be telephoned to the consignee, with the actual shipping notice being mailed as confirmation. This procedure is particularly helpful when the points of origin and delivery of the shipment are within two or three hundred miles of each other, with the prospect that delivery can conceivably be effected within twenty-four hours of loading.

Knowing the number and contents of the car, and the date of shipment, the consignee is in a position to plan the unloading of the car, which may be done with a crane in a yard or with a work train out on the line, or perhaps at some location where it will be necessary to group several gangs to complete the unloading work promptly.

By contacting the yardmaster at the division point or receiving yard, arrangements can readily be made in advance of the car's arrival to route or classify it in such a manner that its ultimate movement to the unloading point is completed without unnecessary duplication of switching moves. Also, the yardmaster is then in a position to advise the consignee promptly by telephone when the car arrives and can give a definite idea as to the exact time that it will be in position for unloading. If this work is to be done with a work train, the car can be placed with the work outfit directly, eliminating the necessity of subsequently switching it out of the

company material "hold track" when making up the work train.

At most termini, if the car of company material arrives before the consignee has been able to give the yardmaster its unloading point, the car is placed on a company material hold track in the classification yard. Ordinarily, in the past, as orders were received from the consignee for placing individual cars at designated unloading points in the terminal area, the yardmaster would switch out the cars and spot them as requested. As a result there would frequently be a delay of one or two days from the time the car arrived in the yard until it was finally spotted for unloading. This delay can be reduced to a minimum if the yardmaster will record the arrival of all cars of company material on an appropriate form while "carding" the train from the waybills, and then advise the consignee by telephone as soon as possible thereafter of the car's location. The consignee can then immediately inform the yardmaster verbally of the car's unloading point and advance the car order for confirmation.

Complete co-operation between the yardmaster and consignee is by far the most important factor in making possible the prompt unloading of cars of company material. When such co-operation exists, both men are fully informed regarding the cars en route, the cars on hand and their ultimate unloading points. Switching moves necessary to spot the cars for unloading will be held to a minimum. Also, the actual unloading operation can be anticipated and carefully planned so that the cars can be released quickly and the work completed in an efficient manner.

Gives Helpful Suggestions

By A. Drager

Maintenance of Way Storekeeper, Central Railroad of New Jersey, Jersey City, N.J.

In order to avoid delays in the release of cars it is necessary for the consignee to plan for their prompt release before they arrive at their destination. This will require that plans be made in advance to have available the necessary man-power, automobile trucks or crane equipment to handle the material. To make this possible the shipper should give the consignee as much advance notice as possible, and not later than when the shipment is ready to leave the point of origin. This notice should be given by sending the consignee a letter, a shipping notice or a copy of the invoice, or by wiring or telephoning him.

On receiving word that the shipment is on the way the consignee should request the transportation department to advise him of the arrival of the car by telephone. This request should preferably be addressed to the party who is responsible for placing the car at the siding or destination, who may either be the yardmaster, the agent or somebody in the freight office.

It is advisable to keep a complete car record in the office of the consignee, entering every car on which notice of shipment has been received, and indicating the car number, the date on which it left the point of origin, the date the car arrived at destination, the date of its release at destination, and the number of days that elapsed between the arrival and release of the car. If there has been an undue delay in receiving the car, the cause should be ascertained in order that it can be eliminated in handling future shipments. This statement also applies to delays that have occurred in the release of cars at their destination.

How Many Men to Supervise?

In view of the present decreased effectiveness of track labor, what is the maximum number of men a foreman should be expected to supervise? An assistant foreman? Does the kind of work make any difference? Why?

Some Reduction Indicated

By General Foreman

This question can best be discussed in general terms, for it is difficult to say definitely that a foreman can supervise only a certain number of men and no more. This is true because there are so many variable factors to take into consideration, including the qualifications of the particular foreman, the type of work to be done, the prevailing standards of maintenance of the particular road and the competence and experience of the men comprising the gang. Parenthetically, it may be pointed out that, generally speaking, the problem of today is not so much one of determining how many men a foreman can supervise but of obtaining the necessary number of men to fill out the various work crews.

However, because of the reduced quality of the labor available for railroad maintenance work at the present time, there is little question that a closer degree of supervision is required today than before the war, a fact that in some instances may make it desirable to place a fewer number of men under the direct supervision of a foreman or an assistant foreman. Obviously, when the men comprising a particular work crew are inexperienced in railroad work, or for other reasons are unable to work effectively without constant supervision, the foreman must accord them more personal attention than otherwise if he expects to maintain the quality and quantity of the work performed or to avoid unsafe practices.

These factors may call for a reduction in the number of men to be supervised by one foreman, but as already indicated this reduction has in many instances taken place automatically as a result of the man-power shortage.

Depends on Type of Work

By Division Engineer

In considering this question it must be assumed that track foremen today are, in the majority of cases, employees of several years' service. The average foreman, therefore, is well versed in all phases of track work. Furthermore, to have been appointed a foreman, he must have indicated his ability to organize his work and handle men safely and efficiently and to the satisfaction of his superiors.

To a large degree it may be said that the number of men a foreman should have for the operation at hand will depend on the type of work to be undertaken. A man qualified to be a foreman should be able, with the assistance of two assistant foremen, to supervise 30 men on an out-of-face surfacing job, using a 16-tool pneumatic tamping outfit. In making this statement it is assumed that the work will be done under traffic on a high-speed track with frequent train movements. It is also assumed that the foreman has the required ability to organize his gang properly, appointing trustworthy watchmen and whistlemen, and has taken the time to train his men in the proper manner of clearing the tracks on the approach of trains. The further assumption is made that the men in the tamping gang will be more or less closely bunched.

For ordinary maintenance work a man qualified to be a track foreman

should be able to handle from 12 to 14 men without the assistance of an assistant foreman. Whether or not he is able to do this will depend on his ability to organize and train the men assigned to him in efficient and safe methods of doing the work. Under present conditions, considering the increasing dearth of capable track men, the track foreman must have this ability in higher degree than ever before.

With reference to assistant foremen, it may be said that men holding this position have been appointed to it because they have given indications of being able to assimilate such information as has been given them in the process of training and have also indicated their ability to plan work and handle men assigned to them.

Regardless of the number of men that may be assigned to a foreman or an assistant foreman, a man in either of these positions, under the conditions that exist today, must at all times be able to exercise good judgment in the planning and execution of work, and must be able to exercise a high degree of patience in handling such men as are assigned to him or as he is able to hire himself.

Treated Lumber in Buildings

To what extent is the use of treated lumber economical or practicable for buildings? What members? What form of treatment is most desirable?

Should Be Considered

By L. E. Peyser
Principal Assistant Architect, Southern Pacific Company, San Francisco, Calif.

In designing buildings that are wholly or partly of wood construction, consideration should be given to the use of treated lumber on the basis of economy resulting from reduced maintenance costs, and the reduction of the fire hazard. Generally speaking, it is false economy to use untreated material for sills or other members that are subject to ground moisture, or in localities where there is danger of termite infestation. The lack of treatment will not only result in increased maintenance costs for such members, but it will, in addition, increase the hazard of decay and of termite infestation in other parts of the structure.

In frame structures founded on mud sills or on low masonry foundations, all members up to the undersides of the floor joists should be treated. In cases where it is necessary that wood members be enclosed wholly or partly in masonry they should be constructed of treated material as a protection from decay. For the various types of members mentioned above a full-cell treatment of creosote should be used. This should preserve them for their full economical life expectancy.

In structures subject to more than the ordinary fire hazard from interior sources, all lumber of smaller dimensions in the roof framing, including rafters, purlins and roof sheathing, should be given a fire-retardant treatment. Beyond the members mentioned, the extent of the use of treated material should be increased in proportion as the fire hazard increases due to the type of work performed in the particular building. In extreme cases it might be well to subject all of the interior wood framing to a fire-retardant treatment. For this purpose a full-cell treatment of chromated zinc chloride is well suited for interior use.

Stresses Economic Factors

By R. B. Putman
Advertising Manager, American Lumber & Treating Co., Chicago

Since the various salt treatments that are used in wood preservation produce a material that can be and is used in the same places in which untreated lumber is ordinarily specified, it is just as practicable to use treated as untreated lumber for building construction. From the viewpoint of economy there are many factors to be considered but they can be summarized as follows: The cost per year charged against a structure will be less if treated lumber is used where untreated lumber would not last as long as the expected service life of the whole structure.

To apply this principle to a specific problem, consider a small passenger station of wood-frame construction, which is built for a life expectancy of twenty years. To use treated lumber in framing the interior partitions would not be economical because experience has shown that dry, protected wood will not decay. On the other hand, if the first-story subfloor is laid on wood joists or on sleepers placed on or attached to concrete, then untreated joists or sleepers and subfloors will have little chance of lasting for the entire life of the structure.

Wood members in a building do not necessarily need to disintegrate before they must be removed. Even a slight softening of the member makes replacement necessary in the interests of safety and to insure that fastenings will hold in the wood. With reference to the comparative service lives of treated and untreated woods, a treated installation will last a minimum of three times as long as one that is untreated, assuming comparable service conditions. This disparity in service life is given emphasis by the fact that construction lumber is now (and will be more so in the future) characterized by a very much higher percentage of sapwood than in the past. Untreated sapwood is easy prey to decay organisms; it is likewise easily penetrated by pressure-treating processes.

Specification 50c of the American Wood-Preservers Association lists thirty different structural members which should be treated if they are placed in contact with the ground, or if they are located in or below the first-floor subfloor of a building. There are two variables to be considered when using this list in designing a building. The first of these is the geographical location of the structure. The second is the probability of moisture being introduced from sources within the building such as cold water pipes, humidifiers, etc.

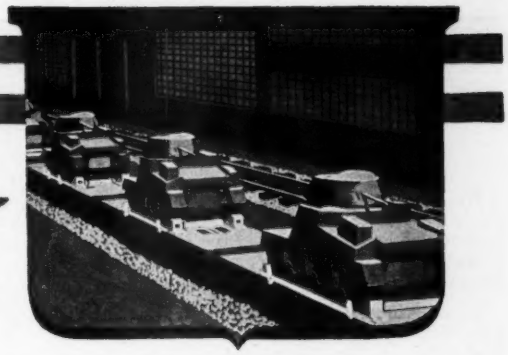
Coal-tar creosote is the preservative that is generally recommended for use in treating wood that is buried in or laid on the ground, while salt preservatives are recommended for the treatment of construction lumber that is to be used above the ground. Where circumstances require that salt treated wood be inserted in or on the ground, a somewhat larger than normal retention of chemicals is recommended. Creosoted wood that is to be used above the ground can be given a lighter treatment, preferably by the empty-cell process, than is generally specified for more severe service conditions.

Termites Are Factor

By H. M. Tremaine
District Engineer, Northern Pacific, Spokane, Wash.

It is economical and practicable to use treated lumber in building construction for all members that come in contact with the ground, and in regions where termites are prevalent the entire building may be treated economically and practically. The kind of treatment most desirable is open to discussion.

NEWS of the Month



Cars Now $1.15 Per Day

The car service rules of the Association of American Railroads were amended, effective February 1, to provide for new freight car per diem rates of $1.15 in lieu of the long established rate of $1.00 in payment for the use of foreign lines freight cars in normal interchange service.

All-Time Peak Reached In Military Sleeper Travel

In spite of the fact that the United States has more than 6,000,000 fighting men overseas, the number of Pullman cars being supplied in this country for military service is at an all-time peak, and requirements are expected to increase rather than decrease during the next few months, according to Champ Carry, executive vice-president of the Pullman Company, in a report to the Association of American Railroads.

Mr. Carry revealed that during the 18-month period ending last November, Pullman furnished 422,958 cars for military use, an average of more than 25,000 cars a month. During this period 16,318,680 troops were carried, compared with 6,426,656 during a similar period of the last war. Contrary to general expectations, Mr. Carry said, military demands have tended to increase during the last few months due to the necessity of providing cars for the accommodation of returning wounded veterans.

Railroad Jobs for Boys Analyzed in New Leaflet

In an effort to channel boys of 16 and 17, who seek employment on the railroads, into jobs where they are least likely to suffer injury to themselves or cause injury to others, the Children's Bureau of the Department of Labor, working with the Association of American Railroads, the railway brotherhoods, and government agencies concerned with transportation, has drawn up "advisory standards" for the employment of young workers in the industry.

The bureau's recommendations are set forth in leaflet No. 11 of a series, "Which Jobs for Young Workers?" In general, it suggests that the jobs that boys can perform with a fair degree of safety are those in the clerical category and those involved in maintenance of way, maintenance of equipment, stores, baggage and parcel rooms, and in stations and warehouses. Jobs considered too hazardous are those involved in the operation of trains, work on bridges and scaffolds, and work as section hands in yards or where traffic is especially heavy.

In addition to its recommendations regarding the suitability of jobs, the bureau's leaflet contains a digest of state laws affecting the employment of minors on railroads. It points out that, in a number of states, the minimum age is two years higher than for general employment.

Fissures Derail Two Passenger Trains

Two recent derailments of passenger trains, which resulted in 2 deaths and 172 injuries, were found by the Interstate Commerce Commission to have been caused by broken rails, resulting from transverse fissures.

The first accident occurred on November 18, 1944, on the Atlantic Coast Line, near Hortense, Ga., and resulted in the injury of 134 passengers and employees. The train, No. 91, a southward first-class train, consisting of a three-unit Diesel-electric locomotive and 18 cars, was moving at an estimated speed of 85 m.p.h., in territory where the maximum authorized speed was 90 m.p.h., when the rear truck of the last unit of the locomotive became derailed. The locomotive units and the first car remained coupled and stopped about 3,050 ft. south of the point of derailment. Of the remainder of the train, all but the last five cars were derailed.

After the accident a broken rail was found on the east side of the track. The rail, which was of 100-lb. section, rolled in May, 1929, was laid in June of that year on 24 ties to the rail length. It was fully tieplated, single-spiked, provided with 4 anchors per rail length, and was ballasted to a depth of 9 in. with slag and granite. The rail broke into many pieces, of which 10 were found. The first break occurred between two ties, at a point about 12 in. south of the receiving end of the rail, directly at the south ends of the angle bars. The bond wire connections for the automatic block signal circuits bridged the break, allowing the automatic signals to display the proceed aspect. At this break there was a transverse fissure, which covered 70 per cent of the cross sectional area of the head of the rail, and which had progressed very close to the outer surface. The battered condition of the rail at the south end of the break indicated that complete failure had occurred some time prior to the accident.

The track involved was last inspected by the section foreman and the signal maintainer about 36 hours prior to the accident. A transverse fissure detector car was last operated over this territory on November 11, 1944.

The second accident occurred on December 24, on the Chicago & North Western, near Poplar Grove, Ill., and resulted in the death of two passengers and injury to 38 other persons. The eastward passenger train, No. 522, consisted of a locomotive and 15 cars, and was moving at an estimated speed of 45 m.p.h., when its twelfth and thirteenth cars became derailed and came to rest on their sides, down an embankment, about 600 ft. east of the point of derailment.

After the accident it was found that a rail on the south side of the track was broken in many pieces. Transverse fissures were found at six breaks, covering from 10 to 70 per cent of the cross sectional area of the rail head, but none of them extended to the outer surface of the rail. According to the I.C.C. report on this accident, it appears that the failure of the rail occurred when the front of the train passed over it, one 5-in piece between two breaks being forced out of alinement, and the other fractures occurred as the wheels jumped this gap.

The report pointed out that the track was last inspected by the section foreman about 32 hours before the accident, no defect being observed. A transverse fissure detector car was operated over this territory in December, 1941, and the next test was scheduled for 1945, the spacing of such tests being determined by the record of rail failures and the tonnage moving over the track.

General Gray Decorated For Work in European Theater

Brigadier General Carl R. Gray, Jr., has been awarded the Distinguished Service Medal for his outstanding work as Director General of the 1st Military Railway Service in Italy and southern France. The citation, which covers the period from October 20, 1943, to November 1, 1944, refers especially to General Gray's "exceptionally meritorious service to the Government in a duty of great responsibility in Italy and southern France," where, "due to Allied bombings and German demolitions, rail, yard and power facilities were thoroughly demolished." In civilian life General Gray was executive vice-president of the Chicago, St. Paul, Minneapolis & Omaha.

Changes in Railway Personnel

General

W. L. Anderson, division engineer on the St. Louis-San Francisco Co., has been promoted to assistant to the general manager, with headquarters as before at Springfield, Mo.

W. S. Moore, division engineer of the Louisville division of the Louisville & Nashville, has been promoted to acting superintendent with headquarters, as before, at Louisville, Ky.

Melville I. Dunn, Jr., a trainmaster on the Chesapeake & Ohio, and an engineer by training and experience, has been promoted to superintendent, with headquarters as before at Peru, Ind.

Robert W. Marye, chief engineer of the Atlantic Coast Line and the Charleston & Western Carolina, at Wilmington, N.C., has been appointed general manager of the Charleston & Western Carolina, at Augusta, Ga.

M. Henry Gold, asistant general manager of the Seaboard, at Raleigh, N.C., and an engineer by training and experience, has been appointed superintendent of the Alabama division, with headquarters at Savannah, Ga.

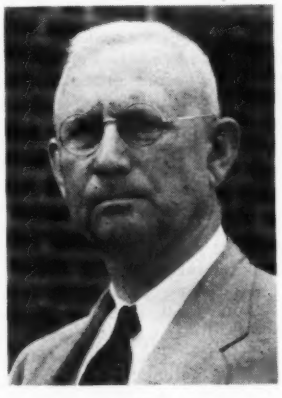
G. M. Cornell, director of the transportation equipment division of the War Production Board and **formerly assistant cost** engineer of the Chesapeake & Ohio, has been appointed assistant to the president of the Virginian, with headquarters at Norfolk, Va.

Frank Stearns Austin, whose promotion to general purchasing agent of the New York Central System, with headquarters at New York, was reported in the February issue, was born at Lynn, Mass., on November 6, 1886, and attended Dartmouth College and Thayer School of Civil Engineering, receiving a B.S. degree in 1909. He entered railroading the same year as a chainman on the Boston & Albany (operated by the New York Central), and after serving as rodman and transitman at Boston, Mass., and assistant supervisor of track at Pittsfield, Mass., he was advanced to supervisor of track at Worcester, Mass., in October, 1913. He returned to Boston in the same capacity in July, 1916, and was appointed general storekeeper at Springfield, Mass., the following year. In July, 1927, Mr. Austin was named purchasing agent at Boston, where he remained until his appointment as assistant purchasing agent of the New York Central at New York in March, 1935. He was promoted to purchasing agent there on August 1, 1940, holding that post until his recent appointment as general purchasing agent, system.

Raymond L. Gebhardt, vice-president—operations of the New York, Ontario & Western, at New York, has been appointed trustee. Mr. Gebhardt, who was born on September 9, 1882, at Easton, Pa., attended Lafayette College of Civil Engineering and entered railroad service on August 24, 1908, as draftsman with the Lehigh Valley. In April, 1910, he was appointed assistant engineer, and on October 15, 1912, he became division engineer of the same road. On April 15, 1916, Mr. Gebhardt was appointed trainmaster, and on July 23, 1918, he became division superintendent, serving on various divisions until July 1, 1941, when he left the Lehigh Valley to become executive assistant to the trustee of the New York, Ontario & Western. Mr. Gebhardt was elected vice-president—operations of that road in August, 1942, and remained in that position until his recent appointment as trustee.

Raymond L. Gebhardt

Leonard C. Ayers, whose retirement as assistant general manager of the Norfolk & Western with headquarters at Roanoke, Va., was reported in the February issue,



Leonard C. Ayers

was born at Oak Level, Va., on April 8, 1875, and entered railway service as a water boy with the Roanoke & Southern (now a part of the Norfolk & Western) in 1890. After serving in various minor capacities in the maintenance of way and operating departments, Mr. Ayers was promoted to track foreman in 1895. In 1901 he was advanced to roadmaster, later advancing to general supervisor of maintenance and structures. In 1909 he was made superintendent of construction, leaving the maintenance department in September, 1912, to become assistant superintendent of the Scioto division. He was promoted to superintendent of the Shenandoah division on February 16, 1923, and further promoted to general superintendent, Eastern general division, on October 1, 1934. On December 1, 1940, Mr. Ayers was promoted to assistant general manager.

P. M. Roeper, whose promotion to superintendent of freight transportation of the Eastern region of the Pennsylvania, with headquarters at Philadelphia, Pa., was reported in the February issue, was born at McKeesport, Pa., and received his higher education from the University of Southern California and Carnegie Institute of Technology. In 1928, he entered the service of the Pennsylvania as an assistant on the engineer corps at Middletown, Pa. After holding various positions at Sunbury, Pa., Chester, Newport, Hollidaysburg and New Castle, Mr. Roeper was appointed division engineer, Panhandle division, at Pittsburgh, Pa., in January, 1942, remaining in that post until June, 1943, when he was named superintendent of the Wilkes-Barre division at Sunbury, the position he held at the time of his recent assignment as superintendent of freight transportation.

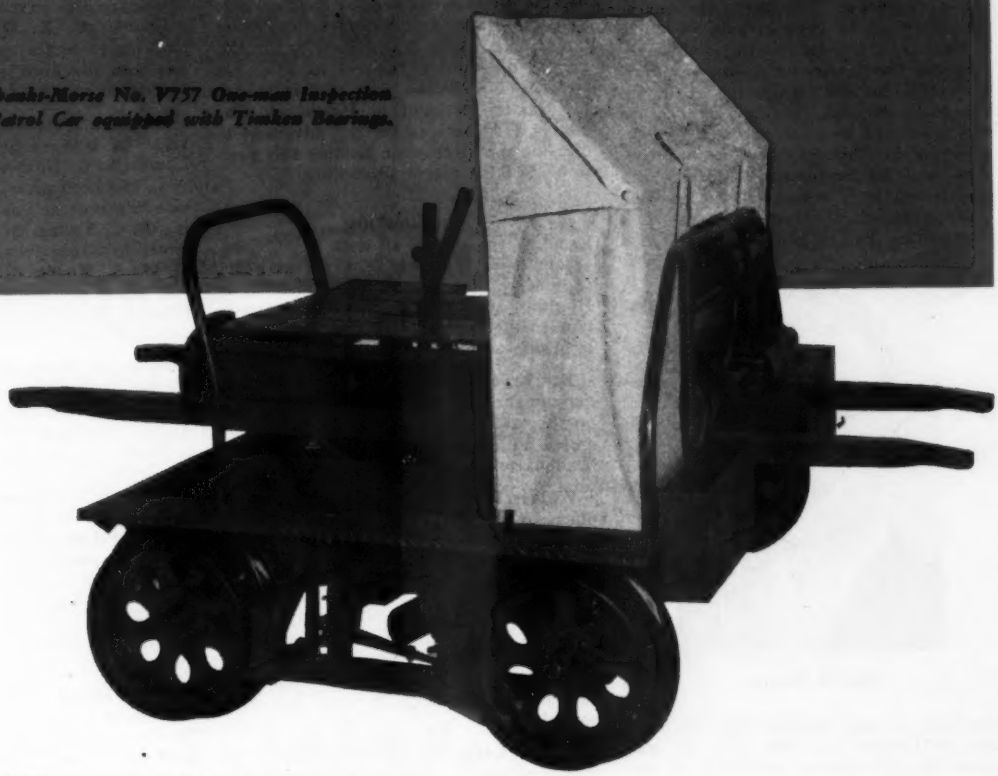
Buford W. Tyler, Jr., whose promotion to superintendent of the Renovo division of the Pennsylvania, with headquarters at Erie, Pa., was reported in the February issue, was born at Shelbyville, Ill., on April 14, 1903, and was graduated from Rose Polytechnic Institute in 1923. He entered railway service on January 21, 1925, as an assistant on the engineer corps of the Pennsylvania at St. Louis, Mo. On December 22, 1926, he was promoted to assistant supervisor of track at Bordentown, N.J., later being transferred successively to Chester, Pa., and Tyrone. In 1929 he was advanced to supervisor of track at Wilkes-Barre, Pa., later being transferred successively to Chambersburg, Pa., Lancaster and Trafford. Mr. Tyler was promoted to assistant division engineer at New York in 1934 and later was advanced to division engineer at Pittsburgh, Pa. In 1939 he was appointed engineer of the Washington terminal at Washington, D.C., and on January 1, 1942, he was appointed division engineer of the Maryland division, which position he held until his recent promotion.

A. J. Greenough, whose promotion to superintendent of the Wilkes-Barre division of the Pennsylvania, with headquarters at Sunbury, Pa., was reported in the February issue, was born in San Francisco, Cal., on September 20, 1905, and attended Union College, Schenectady, N.Y. He entered railway service on July 1, 1928, as an assistant on the engineering corps of the New York division, later being transferred to Lancaster, Pa. In March, 1929, he was promoted to assistant supervisor of track at York, Pa., and was later transferred successively to South Philadelphia, Pa., and Lewistown. In September, 1933, he was promoted to supervisor

(Continued on page 302)

Ready to Roll

AT A MOMENT'S NOTICE



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TAPERED ROLLER BEARINGS

of track on the Cincinnati division, with headquarters at Anderson, Ind. Mr. Greenough was transferred to Harrisburg, Pa., in November, 1934, and to the New York division, with headquarters at New Brunswick, N.J., in January, 1936. In 1939 he was advanced to division engineer at Columbus, Ohio, and a year later was transferred to the Pittsburgh division.

Paul E. Feucht, whose promotion to general manager, Western region, of the Pennsylvania, with headquarters at Chicago, was reported in the February issue, was born at Indianapolis, Ind., on January 4, 1900, and received his college education at Purdue University. He entered the service of the Pennsylvania on March 1, 1923, as an assistant on the engineering corps of the Louisville division, and in May, 1925, he was transferred to the Indianapolis division. In January, 1927, he was promoted to assistant track supervisor on the Philadelphia Terminal division, and in September, 1928, he was transferred to Tyrone, Pa. Mr. Feucht was advanced to track supervisor at Norristown, Pa., in January, 1929, and a

Paul E. Feucht

year later he was transferred to the main line at Tyrone. In July, 1933, he was promoted to division engineer of the Renovo division, and in October, 1934, he was transferred to the Fort Wayne division. Mr. Feucht was advanced to superintendent of the Wilkes-Barre division on April 1, 1935, and on May 1, 1936, he was appointed superintendent of passenger transportation of the Eastern region, with headquarters at Philadelphia, Pa. In 1939 he was promoted to general superintendent of the Southwestern division, with headquarters at Indianapolis, Ind., and in February, 1942, he was transferred to the Lake division, with headquarters at Cleveland, Ohio, remaining in that location until his new appointment.

J. L. Cranwell, whose promotion to general superintendent of the Lakes division of the Pennsylvania, with headquarters at Cleveland, Ohio, was reported in the February issue, was born on October 31, 1905, at Shreveport, La. He was graduated as a civil engineer from the University of South Carolina in 1926 and entered railroad service on July 13, 1926, as a rodman on the Pennsylvania, at Cape Charles, Va., being transferred to Baltimore, Md., on December 19, 1926. Mr. Cranwell was appointed assistant on engineer corps at Washington, D.C., on April 1, 1927, becoming assistant supervisor at Hollidaysburg, Pa., on May 12, 1927, and later serving successively at Jamesburg, N.J., and Jersey City. He was promoted to supervisor at Bordentown, N.J., on January 1, 1930. On January 1, 1933, he was transferred to Williamsport, Pa., as supervisor, being moved to the East Liberty-Johnstown, Pa., subdivision on October 1, 1933. Mr. Cranwell was promoted to assistant division engineer at Philadelphia, Pa., on February 1, 1936, and was transferred to Fort Wayne, Ind., on July 1, 1937. On February 1, 1938, he became division engineer of the St. Louis division, with headquarters at Terre Haute, Ind., being transferred to the Columbus division on January 16, 1939. On October 1, 1939, he was transferred to the Eastern division, at Pittsburgh, Pa., and in 1940 he was further advanced to division superintendent, holding this position until his recent promotion.

Engineering

James W. Wiggins, principal assistant engineer of the Bangor & Aroostook, at Houlton, Me., has been appointed assistant to the chief engineer of the Boston & Maine at Boston, Mass.

H. J. Bogardus, assistant engineer maintenance of way of the Pere Marquette, at Saginaw, Mich., has been promoted to assistant chief engineer, with headquarters at Detroit, Mich.

Walker Paul, executive assistant in the office of the president of the Southern Pacific, at San Francisco, Cal., has been promoted to assistant to the chief engineer, with the same headquarters.

Harold C. Tunison has been appointed assistant engineer maintenance of way, of the Lehigh & New England, at Bethlehem, Pa. The position of assistant to engineer maintenance of way, has been abolished.

R. W. Lang, an instrumentman, has been promoted to asistant engineer on the Memphis Terminal division of the Illinois Central, instead of assistant division engineer, as reported in the February issue. Mr. Lang's headquarters are at Memphis, Tenn.

Lawrence Sugg Jeffords, chief of personnell of the Atlantic Coast Line and the Charleston & Western Carolina, has been promoted to chief engineer of both lines, with headquarters, as before, at Wilmington, N.C., succeeding **R. W. Marye,** who has been appointed general manager of the Charleston & Western Carolina, at Augusta, Ga.

W. A. Bogert, an assistant engineer on Lines East of the New York Central, has been promoted to assistant division engineer, with headquarters at Cleveland, Ohio.

J. F. McCook, an asistant engineer on Lines East of the New York Central, has been promoted to asistant division engineer at Chicago.

Clarence M. Segraves, bridge designer on the Delaware, Lackawanna & Western, at Hoboken, N.J., has been named assistant engineer of structures, with the same headquarters.

Francis Martin, formerly in the engineering department of the Delaware, Lackawanna & Western, from 1918 to 1941, has returned to that road as assistant division engineer at Buffalo, N.Y.

R. H. Morrison, bridge and building superintendent of the Bangor & Aroostook, at Houlton, Me., has been promoted to principal assistant engineer, with the same headquarters, succeeding **James W. Wiggins,** whose appointment as assistant to the chief engineer of the Boston & Maine is announced elsewhere in these columns. **C. E. Garcelon,** bridge and building inspector and part-time foreman, has been advanced to bridge and building superintendent at Houlton.

Robert L. Samuell, Jr., assistant supervisor of bridges and buildings on the Louisville & Nashville, at Birmingham, Ala., has been promoted to asistant division engineer at Louisville, Ky., succeeding **R. C. Young, Sr.,** who has been promoted to acting division engineer, in place of **W. S. Moore,** division engineer, who has been promoted to acting superintendent, with headquarters, as before, at Louisville.

Frederick H. Boulton, assistant engineer on the Knoxville and Atlanta division of the Louisville & Nashville, at Knoxville, Tenn., has been promoted to assistant engineer miscellaneous department, at Louisville, Ky., succeeding **Jack Small,** who has been advanced to assistant engineer, chief engineers office, at Louisville, replacing **James K. Gloster.** Mr. Gloster has been promoted to assistant supervisor of bridges and buildings on the Louisville division, at Louisville, succeeding **Philip Eastes,** who has been advanced to assistant bridge engineer, with the same headquarters.

A. A. Pogue, track supervisor on the Louisville & Nashville at Paris, Ky., has been promoted to assistant division engineer at Latonia, Ky., succeeding **I. W. Newman,** who has been advanced to division engineer at Ravenna, Ky., in place of **John V. Estes.** Mr. Estes has been promoted to assistant bridge engineer, Louisville, Ky., in place of **John C. Nichols,** who has been advanced to associate bridge engineer, with the same headquarters, succeeding **Charles K. Bruce,** who has been promoted to bridge engineer at Louisville, in place of **J. McClure Salmon,** whose death is reported elsewhere in these columns.

Thomas P. Watson, assistant engineer on the Pennsylvania's Central region, at East Aurora, N.Y., has been appointed assistant to the chief engineer of the Central region, at Pittsburgh, Pa., succeeding Donald L. Sommerville, whose promotion to chief engineer was reported in the December issue.

J. W. Reed, master carpenter of the Pittsburgh division of the Pennsylvania, at Pittsburgh, Pa., has been promoted to assistant engineer in the office of the chief engineer maintenance of way, at Chicago, succeeding **W. G. Kammerer,**

(Continued on page 304)

SCHRAMM'S

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COMPRESSOR

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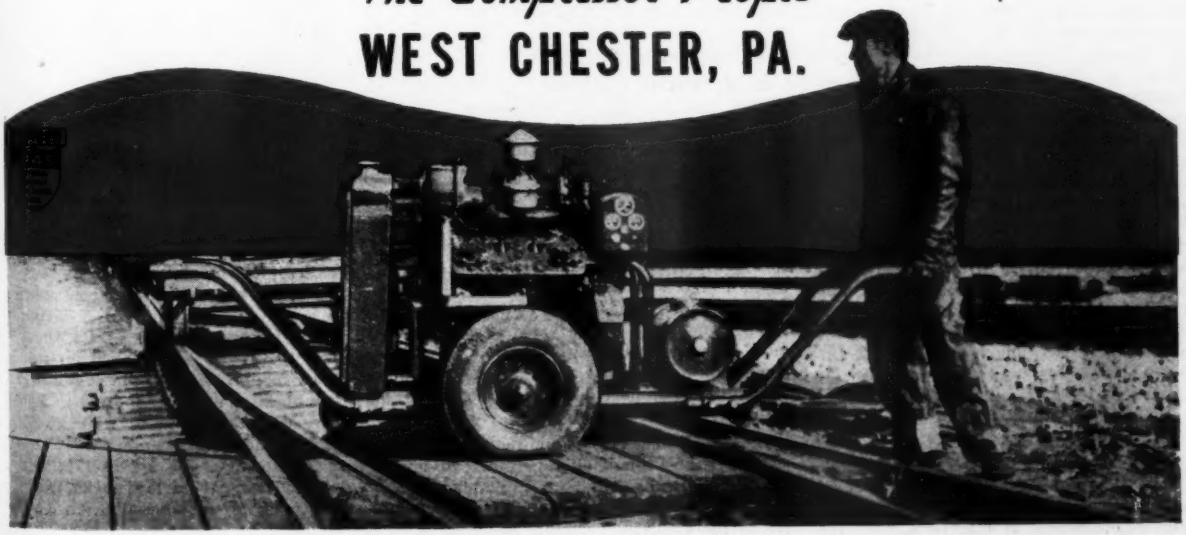

who has been promoted to assistant engineer of bridges and buildings of the New York Zone, with headquarters at New York.

Frederick L. Lloyd, whose promotion to division engineer on the Canadian National, with headquarters at Winnipeg, Man., was reported in the February issue, was born in Wales on August 1, 1887, and, after a technical education, entered railway service with the Hudson's Bay Railway (now Canadian National) in

Frederick L. Lloyd

August, 1908, as a draftsman. In 1913 Mr. Lloyd was promoted to resident engineer, remaining in that position until 1915, when he entered military service. He returned from World War I in 1919, to become an instrumentman on the Canadian National, and in 1935 was advanced to assistant division engineer, holding that position until his recent promotion to division engineer.

Thomas J. Murray, whose promotion to division engineer of the Conemaugh division of the Pennsylvania, with headquarters at Pittsburgh, Pa., was reported in the February issue, was born at Piqua, Ohio, on August 19, 1901, and attended the University of Dayton. He entered railroad service in July, 1924, on the Central Romana (a sugar cane railroad in the Dominican Republic) and in February, 1926, he went with the Pennsylvania as an assistant on the engineer corps of the Toledo division, later being transferred to the Cincinnati division. In January, 1929, he was appointed assistant supervisor of track on the St. Louis division, later being transferred successively to the Columbus and Cincinnati divisions. Mr. Murray was promoted to supervisor of track on the Monongahela division, at Homestead, Pa., in October, 1933, and in February, 1936, he was transferred to the Maryland division at Wilmington, Del. In December, 1941, he was advanced to assistant division engineer of the New York division at Jersey City, N.J., which position he held until his recent promotion to division engineer at Pittsburgh.

Track

R. D. Rhyne has been appointed general roadmaster of the Missouri & Arkansas, with headquarters at Harrison, Ark. He will have jurisdiction over all of the track forces on the road.

J. D. Leak has been appointed roadmaster on the St. Louis-San Francisco, with headquarters at Cherokee, Kan., succeeding **A. M. Hamm,** who has been granted a leave of absence on account of ill health.

M. B. Kirschbaum, general foreman on the Chicago, Milwaukee, St. Paul & Pacific, has been promoted to roadmaster at Terre Haute, Ind., succeeding **J. B. Johnson,** who has been transferred to Aberdeen, S.D., relieving **J. L. Vavra,** assigned to other duties.

C. J. Wallace, assistant supervisor of track on the Chicago Terminal division of the Illinois Central, at Chicago, has been promoted to supervisor of track on the Illinois division, with headquarters at Gilman, Ill., succeeding **F. B. Noonan,** who has been promoted to assistant trainmaster.

Jesse J. Stiles, assistant supervisor of track on the Eastern division of the Pennsylvania, at Wooster, Ohio, has been advanced to supervisor of track on the Panhandle division, with headquarters at Wheeling, W. Va. (Mr. Stiles name was incorrectly given as K. J. Steele in the January issue.)

Mr. Stiles was born at Cramer, Pa., on June 26, 1900, and studied a State extension course in 1916 and 1917, and an I. C. S. correspondence course in 1939. He entered railway service as a trackman on the Cresson division of the Pennsylvania on April 25, 1922, and later served on the Pittsburgh division. In 1934 he was promoted to track foreman at Johnstown, Pa., and in 1939 he was transferred to Pittsburgh, Pa. Mr. Stiles was advanced to general foreman at East Liberty, Pa., in 1942, and was transferred to Wooster, Ohio, in 1943. Later the same year, he was promoted to assistant supervisor of track, with the same headquarters, which position he held until his recent promotion, effective December 1, 1944.

Bridge and Building

Willard E. Crounse, bridge and building inspector on the Delaware & Hudson, has been promoted to bridge and building supervisor on the Champlain division, with headquarters at Plattsburg, N.Y.

C. M. Walker, general foreman of the bridge and building department of the Canadian National at Moncton, N.B., has been promoted to bridge and building master of the Moncton division, with the same headquarters, succeeding **J. H. McClure,** who has retired.

C. E. Garcelon, bridge and building inspector and part-time foreman on the Bangor & Aroostook, at Houlton, Me., has been promoted to bridge and building superintendent, with the same headquarters, succeeding **R. H. Morrison,** whose promotion to principal assistant engineer, at Houlton, is reported elsewhere in these columns.

H. H. Williams, assistant master carpenter of the Philadelphia Terminal division of the Pennsylvania, at Philadelphia, Pa., has been promoted to master carpenter of the Chicago Terminal division, at Chicago, succeeding **D. C. D. Todd,** who has been transferred to the Pittsburgh division, with headquarters at Pittsburgh, Pa., replacing **J. W. Reed,** whose promotion to assistant engineer at Chicago is reported elsewhere in these columns.

Obituary

T. W. Brown, retired roadmaster on the Canadian National, at Ottawa, Ont., died recently.

J. McClure Salmon, bridge engineer of the Louisville & Nashville, died in Louisville, Ky., on January 30.

James C. Patterson, who retired in February, 1944, as chief engineer maintenance of way of the Erie, with headquarters at Cleveland, Ohio, died at Orange, N. J., on February 18.

James M. Reid, who retired in 1914 as chief engineer of the National Railways of Mexico, died recently at his home in Pilot Point, Tex. Mr. Reid, who was born near Americus, Ga., on October 12, 1858, entered railway service in 1875 with the Western Railway of Alabama, later serving as engineer on railway construction projects in this country, Africa and Mexico.

Joseph Weidel, who retired in January, 1943, as system valuation engineer of the Atchison, Topeka & Santa Fe, and whose death at National City, Cal., on January 6, was reported in the February issue, was born in Lafayette county, Tex., on February 22, 1873, and entered railroad service in 1900 as a chainman on the Santa Fe at Pueblo, Colo., later being advanced successively to draftsman, instrumentman and asistant engineer on various work in Colorado and New Mexico. In 1902 he went with the Mexican Central (now

Joseph Weidel

a part of the National Railways of Mexico), as resident engineer, and in 1904, he returned to the Santa Fe as assistant engineer, with headquarters at La Junta, Colo. In 1906 he was employed on railroad construction work in the sugar beet territory of eastern Colorado, and in 1907 he returned to the Santa Fe as engineer in charge of the construction of the Raton tunnel at Raton Pass, N.M. In 1911, Mr. Weidel was transferred to Topeka, Kan., being advanced to system valuation engineer in 1915.

(Continued on page 306)

RAILWAY WEEDS

Advanced 1945 Technique for their Control

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Association News

Bridge and Building Association

The committee appointed to complete the personnel of technical committees to make studies during the current year has practically completed its work, and several of the committees are already actively engaged in the study of their assignments for the current year. It is expected that the complete personnel of all committees can be announced in the April issue of *Maintenance*. To plan the work of the association in the months ahead, as well as to guide and review the work of committees, President J. L. Varkar has called a meeting of the Executive committee, in Chicago, on April 16.

Roadmasters' Association

The work of selecting the chairman and members of technical committees to carry on the studies of the association during the current year has been practically completed, and some of the committees are already at work compiling information for their reports. To review the work done to date and to carry forward the routine activities of the association, President E. L. Banion has called a meeting of the Executive committee, in Chicago, on April 7.

American Railway Engineering Association

In view of the cancellation of the annual meeting of the association, which was to have been held in Chicago on March 13-15, as announced in the February issue, the Board of Direction of the association will hold a meeting in the Palmer House, Chicago, on March 14, to which both the outgoing and incoming officers have been invited. Preliminary to this meeting, a special committee of the Board has been reviewing the committee reports in preparation for submitting to the membership by letter ballot those proposals for changes in the Manual. The reports and letter-ballot decisions, together with such written discussions of the reports as may be received, will then be published in the proceedings of the association for distribution to membership as in past years.

In lieu of the president's address which would normally be made if an annual meeting were held, President F. R. Layng will review at length the activities of the association during the year in the March (Year Book) bulletin of the association, which will be mailed to members late in the first week of March. The Year Book will also include the annual report of Secretary W. S. Lacher, the annual report of Treasurer W. H. Penfield, an alphabetical list of members and a membership classification by railroads.

Following a plan to hold an election of officers, in spite of the fact that there will be no annual meeting, letter ballots were submitted to members during January, containing the slate of nominations for officers prepared by the association's nominating committee. These ballots will be canvassed in the office of the association on March 2, and the results announced promptly.

At the Board meeting on March 14, which will be interrupted only by a luncheon tendered to the officers of the association by the National Railway Appliances Association, the Board will pass on the Manual material which is to be submitted to members by letter ballot, and will act upon the recommendations of its Committee on Outline of Work and Personnel of Committees concerning committee assignments and committee personnel in the year ahead. At this meeting also, the newly elected officers of the association will be installed.

During February, Bulletin No. 451 was mailed to members, this bulletin including reports of the committees on Masonry, Roadway and Ballast, Ties, Rail, Track and Wood Preservation. None of the technical committees of the association met during February, and none of them plan a meeting in March.

Metropolitan Maintenance of Way Club

The next meeting of the club will be the annual meeting and will be held on April 3. At the February 8 dinner meeting of the club, Fredric E. Lyford, assistant to the chairman of the board of Merritt-Chapman & Scott Corp., and former trustee of the New York, Ontario & Western, presented an interesting address on the Portuguese African Colonial Railways, following which members asked questions for about one-half hour. Special guests of the meeting included A. A. Sousa Santos, chief mechanical officer of the Portuguese Government Railways, Portuguese East Africa, and two engineers from Portuguese East Africa.

Wood Preservers' Association

At a recent meeting of the Executive committee of the American Wood Preservers' Association in Cincinnati, Ohio, J. H. Bremicker (Pennsylvania Railroad), second vice-president of the association, was appointed first vice-president to fill the vacancy created by the death, on November 30, 1944, of S. D. Hicks, vice-president, Southern Wood Preserving Company, Pittsburgh, Pa. R. H. Rawson, consulting timber engineer, Portland, Ore., and a member of the Executive committee, was appointed second vice-president, succeeding Mr. Bremicker, and G. A. Haggander, assistant chief engineer, system, Chicago, Burlington & Quincy, and a member of several of the technical committees of the association, was appointed a member of the Executive Committee.

Maintenance of Way Club of Chicago

The February meeting of the club, with 162 members and guests in attendance, was held on February 26 in the Ambassador room of Huyler's restaurant, Chicago. The feature of the meeting was a three-part program on Co-Operation among the Track, B. & B. and Signal Forces, which was entered into by E. J. Brown, engineer of track, Burlington system, who represented the track forces; A. L. Essman, principal assistant signal engineer, Burlington system, who represented the signal forces; and R. E. Sheehan, supervisor of bridges, Burlington system, who represented the signal forces. In substance, the comments of these three men not only indicated the importance of close co-operation among the maintenance forces, especially during present war conditions, but also made it clear that such co-operation is desirable under any circumstances, and is entirely feasible.

The next meeting of the club will be held at the usual place, 310 South Michigan Avenue, on March 26, with a program which will give consideration to Employee Training, with special emphasis on the methods which are being employed on the Erie Railroad. The speakers at this meeting will be H. A. McAllister, assistant to the president, Erie, who will discuss the general program of Job Industry Training and Job Methods Training being employed on his road, and I. H. Schram, chief engineer maintenance of way, who will discuss these methods more particularly as applied to the maintenance of way forces.

Supply Trade News

General

The Los Angeles, Cal., plant of **Peerless Pump Division of Food Machinery Corp.** has been awarded its second Army-Navy "E" star for production excellence.

The Emeryville, Cal. plant of **Hubbard & Co.** has been awarded a fourth renewal of its Army-Navy "E."

The **Morrison Railway Supply Corporation,** Buffalo, N. Y., has announced that its Chicago office has been moved to 322 South Michigan Ave., Chicago 4, Ill.

The Army-Navy "E" production award has been given to **Skilsaw, Inc.,** for the fourth consecutive time in recognition of its record in the production of war materials.

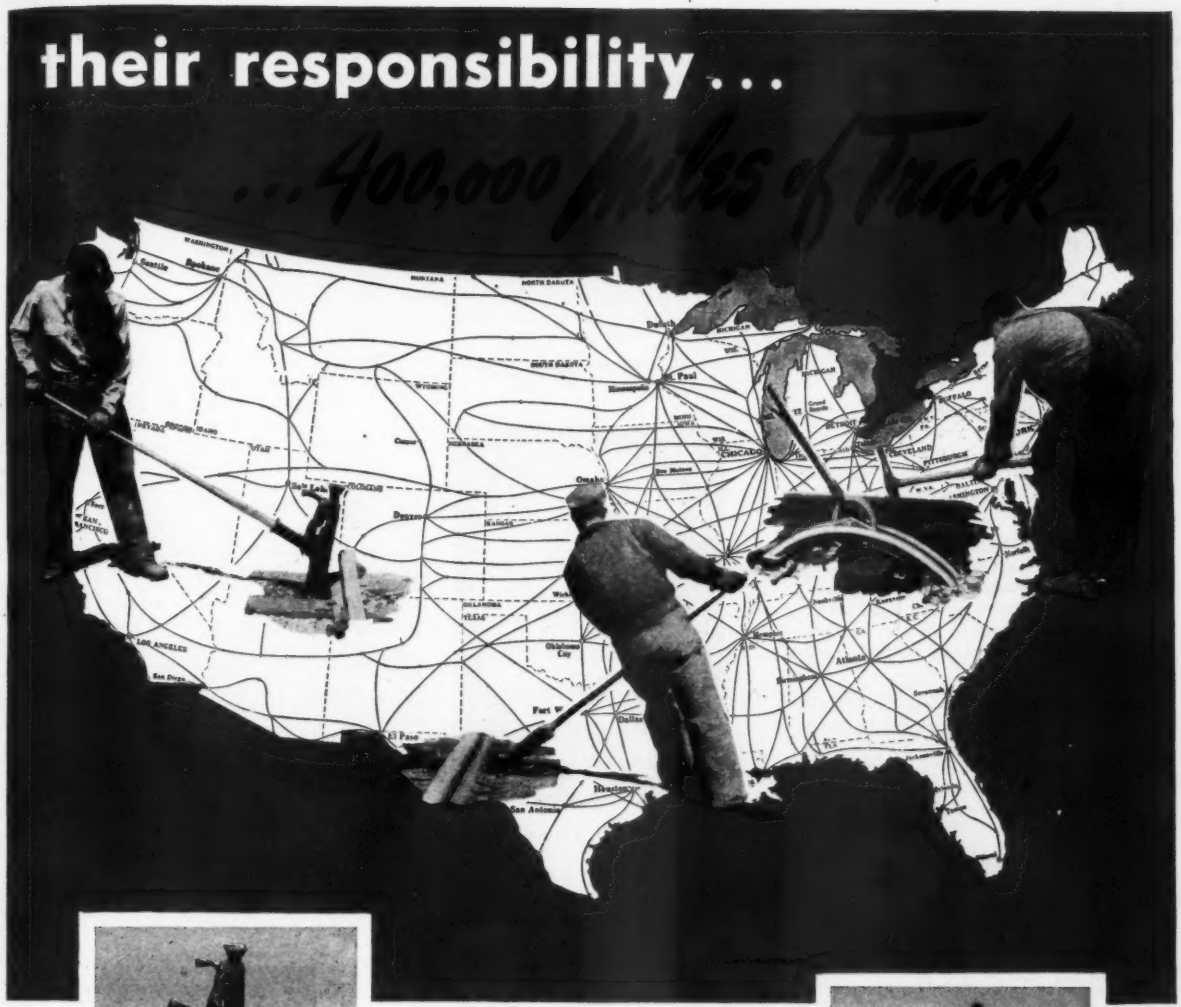
The **Linde Air Products Company,** New York, has prepared for distribution to interested concerns a series of slide films and accompanying literature as an aid in teaching oxy-acetylene welding and cutting operations. The films, which have been prepared in separate series on cutting, welding and safety practices, are a succession of pictures on regular 35-mm. motion picture film that can be projected on a screen singly as still pictures, while the instructor comments.

The **United States Steel Corporation** plans to spend at least $50,000,000 in postwar improvements to its Gary, Ind., mills, Irving S. Olds, chairman, disclosed in an address before the Gary Chamber of Commerce on January 18. This program, he said, embraces improvements and additions to raw material handling equipment, renovation of blast furnaces and machinery, improvements to facilitate the

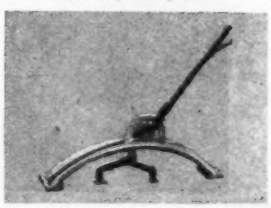
(Continued on page 308)

their responsibility . . .

. . . 400,000 miles of Track



TRACK JACKS—Sturdy BUDA Jacks for every lifting job.



TIE NIPPER—time-saver—holds ties for tamping or spiking.

Rails and ties and roadbed —approximately 400,000 miles of operated trackage—maintained by America's track gangs so that wartime traffic can keep on rolling. The job is accomplished by rugged men and rugged tools—BUDA tools—since 1881 supplier to all main line railroads. Write for descriptive bulletins.

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Personal

John J. Yezbak, head of the news bureau of the **Timken Roller Bearing Company,** Canton, Ohio, has also been appointed manager of public relations of the company.

Waldo E. Bugbee has been appointed sales representative in the Southwest of **Teleweld,** Chicago, with headquarters in the Alamo National building, San Antonio, Tex.

Robert L. Fletcher, who recently returned from five years overseas as a civilian engineer with the Army Engineers, has been appointed to the engineering staff of the Timber Engineering Company, Washington, D. C.

U. E. Sandelin has been promoted to manager of the Seattle, Wash., office of **Allis-Chalmers Manufacturing Co.,** Milwaukee, Wis., succeeding **H. J. Schmitz,** who has been advanced to Pacific regional manager, with headquarters at San Francisco, Cal.

F. A. McGonigle, sales manager of **Mall Tool Co.,** Chicago, has resigned to form the **Power Tools Company,** with offices at 2276 West Como Avenue, St. Paul, Minn. The Power Tools Company has been appointed representative in St. Paul of the Mall Tool Company.

Esty Foster, executive vice-president, has been elected president and a director of the **National Lock Washer Company,** Newark, N. J., to succeed **Cyrus H. Loutrel,** who became chairman of the board, a newly-created office. **Arthur W. Preikschat** and **Gilbert E. Webster,** vice-presidents, have been elected directors of the company.

W. E. Wilcox, lubrication engineer of the railway sales division of the **Texas Company,** at Roanoke, Va., has been promoted to assistant district manager at St. Louis, Mo., succeeding **A. W. Larsen,** who has been advanced to district manager at Chicago, replacing **J. M. P. McCraven,** promoted to assistant manager of the railway sales division, with headquarters at New York. **R. W. Woods,** a sales representative has been promoted to assistant district manager at New York succeeding **C. H. Weisel,** who has been advanced to district manager, in place of **John B. Flynn,** who has also been promoted to assistant manager of the railway sales division, with headquarters as before at New York.

Raymond P. Townsend, general sales manager of the transportation department of **Johns-Manville Sales Corporation,** New York, has been promoted to vice-president and general sales manager of the company's transportation department. A photograph of Mr. Townsend and a sketch of his career were published on page 822 of the October issue at the time of his promotion to general sales manager.

E. J. Kelley, secretary of **Skilsaw, Inc.,** Chicago, has been promoted to vice-president in charge of engineering. Mr. Kelley has for many years directed engineering and new product development for the company. **J. L. McManus,** director of purchases, has been advanced to secretary, succeeding Mr. Kelley. **E. B. McConville,** treasurer of the company, has been elected to the board of directors.

John B. Tinnon, whose election to the board of directors of the **Metal and Thermit Corporation,** New York, was reported in the January issue, received his technical education at Vanderbilt University and entered railway service in 1908 as an assistant engineer for the Chicago City Railway. In 1912 Mr. Tinnon was appointed engineer of way of the Joliet and Chicago Electric Railway, remaining

John B. Tinnon

in that position until 1918, when he entered the Ordnance department of the U.S. Army. He returned to the Joliet and Chicago Electric in 1919 as chief engineer, and in 1924 was appointed manager of the rail welding department of the Metal and Thermit Corporation. In 1928 Mr. Tinnon was appointed manager of sales, and in 1942 he was elected vice-president in charge of sales of that company.

Everett B. Michaels, executive vice-president of the **Hyman-Michaels Company,** Chicago, has been elected president, succeeding **Sparrow E. Purdy. W. J. Ross,** vice-president, has been elected first vice-president, replacing **John P. Purdy,** and **Walter A. Newman** has been named vice-president in place of **John I. Duffy. Clarence W. Wolf** has been appointed assistant vice-president.

S. E. Purdy, John Purdy and Mr. Duffy have resigned from their positions with Hyman-Michaels to form the **Purdy Company,** with offices at 122 South Michigan Ave., Chicago, to engage in railway equipment and general scrap sales.

James M. Sandt, assistant superintendent of the Easton plant of the **Taylor-Wharton Iron and Steel Company,** Easton, Pa., has been promoted to superintendent of that plant, succeeding **L. E. MacFayden,** who has been advanced to works manager in charge of both the Easton and the High Bridge, N. J., plants.

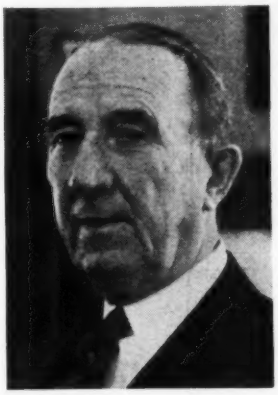
C. F. Oechsle, assistant vice-president of the **Worthington Pump & Machinery Corporation,** has been placed in charge of the Worthington-Ransome construction equipment sales organization with headquarters at Holyoke, Mass. Mr. Oechsle will be assisted by **W. F. Lockhardt,** sales manager of the **Ransome Machinery Company,** a part of the Worthington Corporation, located at Dunellen, N.J., and by **W. J. Fleming,** field sales manager of the Ransome Company, at Holyoke.

R. M. Hamilton, whose appointment as executive vice-president of **D. B. Frampton & Co.,** Pittsburgh, Pa., and the **Baker Wood Preserving Company,** Marion, Ohio, was reported in the January issue, upon returning from overseas duty in World War I, where he served as a first lieutenant, entered the employ of the Central Creosoting Company at Finney, Ohio (now a part of the Wood Preserving division of the Koppers Company). In 1921, he resigned to become associated with the T. J. Moss Tie Company, where he served as general foreman of its St. Louis plant, and later in the sales department. In 1930, he went with D. B. Frampton & Co. as vice-president in charge of sales, resigning in 1936 to become vice-president of the T. J. Moss Tie Company.

A. Charles Irwin, formerly manager of the Railway bureau of the Portland Cement Association, died on January 30, at Presbyterian hospital in Chicago.

Obituary

Robert F. Carr, chairman of the board of the Dearborn Chemical Company, whose death at Chicago on January 22, was reported in the February issue, was born at Argenta, Ill. on November 21, 1871, and was graduated from the University of Illinois in 1893. In the following year he entered the employ of the Dearborn Chemical Company, serving



Robert F. Carr

successively as secretary, vice-president, and general manager, until 1907, when he was elected president. In January, 1944, he was elected chairman of the board. During World War I, Mr. Carr served as a major in the Purchase, Storage and Traffic division of the U. S. Army.

Ellison Balanced Doors.—The Ellison Bronze Co., Inc., Jamestown, N. Y., has published a 12-page booklet describing Ellison balanced doors, which contains many illustrations, detail drawings and specifications on this type of door.

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...keeps 'em Rolling!

THE tremendous task performed by our railroads in transporting both war and civilian goods can only be achieved by proper maintenance and care of our roadways. An integral part of this vital wartime task is being performed by KALAMAZOO railway maintenance equipment. Typical is the KALAMAZOO "4" Derrick Car widely accepted for its time and labor saving performance. It is easily operated and ideal for general track, bridge construction, and repair work. Furnished on either trailer or motor car. Write for full particulars.

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KALAMAZOO
Railway Maintenance Equipment

MANUFACTURERS OF MAINTENANCE EQUIPMENT SINCE 1883

modern Thor HELP MAKE

Model 360G

Save Time on Grinding Jobs

The advanced construction features of Thor Air Grinders mean top speed—peak efficiency—maximum power—light weight and extra stamina for the toughest jobs:

1. THOR "Air Behind the Blades" principle keeps the rotor blades out against the cylinder bushing wall, preventing dead center positions and assuring instant starting under all operating conditions.

2. The solid one piece construction of the THOR rotor permits the use of deeper blade slots and wider blades. This greatly boosts the power and the rate of material removal.

3. The THOR Double-Acting Safety Governor acts to save time in two ways: It regulates spindle speed to the level of highest grinding efficiency for the size and type of wheel used. It prevents racing of wheels at dangerously high speeds even in event of mechanical failure of governor parts.

You will find these top speed construction features, plus others like THOR End Exhaust, Automatic Lubrication, and Labyrinth Seal on Spindle, in a complete line of THOR Air Grinders for every industrial application. For details, write for THOR Pneumatic Catalog No. 52B.

LOOK AT THE RANGE

Number of models	50
Wheel capacities	1½" to 8" dia.
Speeds	3000 to 21,000 r.p.m.
Lengths	5½" to 39"
Weights	18 oz. to 24 lbs.

A STYLE TO MEET YOUR NEEDS

Straight Throttle—The straight throttle permits a constant flow of air into the tool without the necessity of keeping the lever continually depressed. The machine will not stop operating until the valve is manually closed. For grinders up to 4" capacity vitrified wheels, it is the most widely used handle type.

Grip Throttle—The grip throttle is the most desirable type for grinders of 6" wheel capacity and larger. It is adapted for overhead operation, for working in close and awkward places, and for work where a straight forward thrust of the machine is desired. On the grip handle, the throttle is self-closing when the trigger is released.

Lever Throttle—Safety is the primary feature of the lever throttle. The instant the lever is released the power is cut off. This automatic action is helpful in hazardous work on construction and maintenance, and reduces accidents due to carelessness.

tools

TOUGH JOBS EASIER

Chipping Jobs Made Easy

Everything you want in speed and power for fast removal of metal you'll find in Thor Chipping Hammers . . . plus the ability to take a wide range of cuts with the same tool. With Thor's perfect throttle control the hammer can be started slowly with a light blow, then gradually and smoothly stepped up to a maximum speed and power. You get smooth, even chips with less effort by the operator. Positive cylinder valve action, with the air for the power stroke and the air for the return stroke supplied through different ports, assures the ideal combination of speed, power and smoothness. Perfect balance between this speed and power and the weight distribution reduces vibration to a minimum.

Fast Rivet Busting

Thor Rivet Buster construction is the achievement of long years of engineering experience in the building of pneumatic tools for jobs that require speed, power and accuracy. Thor Rivet Busters have all the improvements in design and construction which are so essential to tools that must stand up under the shock and strain to which they are subjected to in today's fast moving industrial jobs.

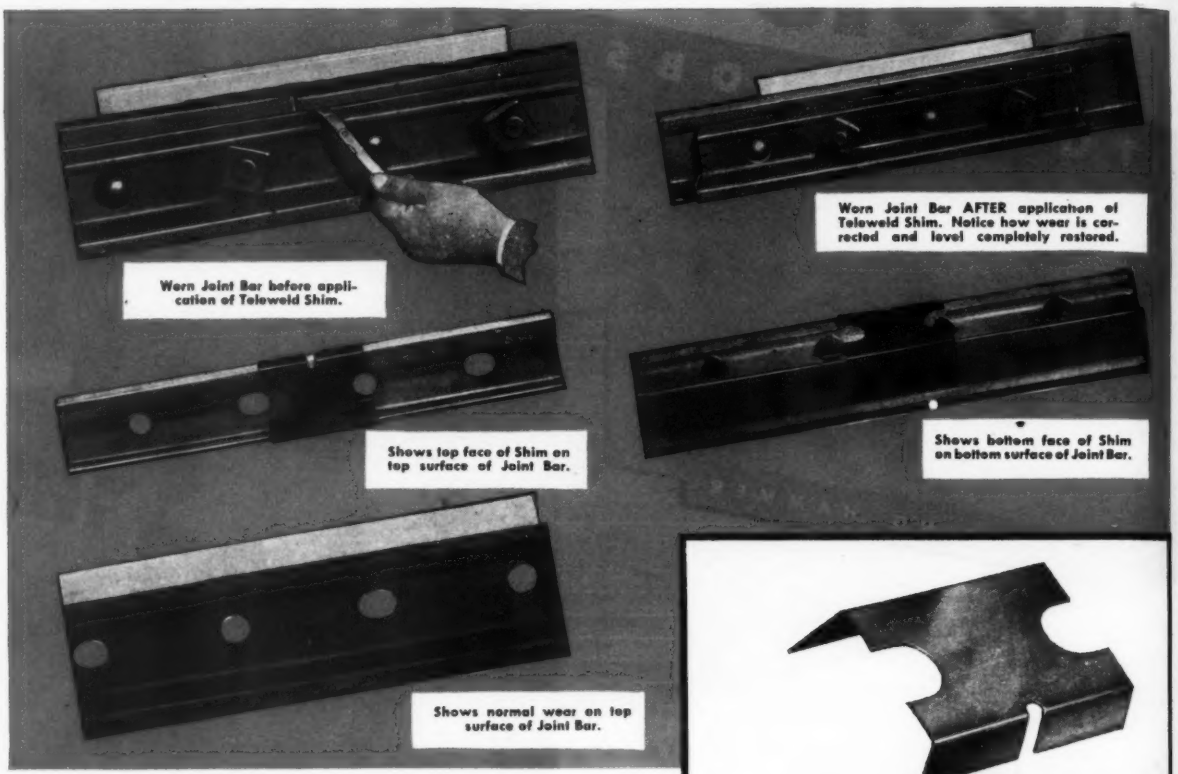
Thor PORTABLE Electric & Pneumatic TOOLS

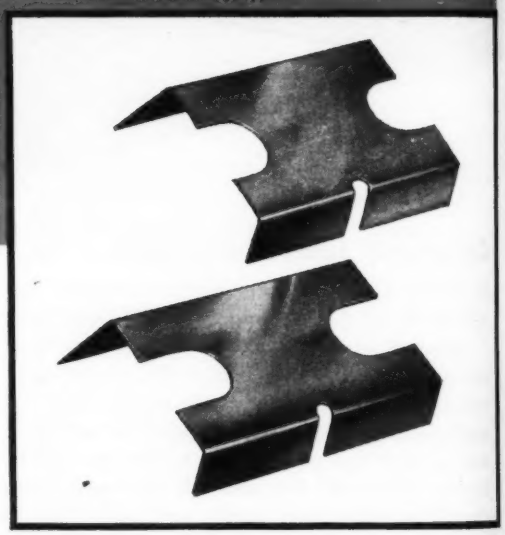
Branches in Principal Cities

INDEPENDENT PNEUMATIC TOOL COMPANY

600 West Jackson Boulevard • Chicago 6, Illinois
New York Los Angeles

Restore Worn Joint Bars to Complete Efficiency


Worn Joint Bar before application of Teleweld Shim.
Worn Joint Bar AFTER application of Teleweld Shim. Notice how wear is corrected and level completely restored.
Shows top face of Shim on top surface of Joint Bar.
Shows bottom face of Shim on bottom surface of Joint Bar.
Shows normal wear on top surface of Joint Bar.



at 1/4 the cost of Rebuilding or Reforming

TIME and manpower saved would be enough reason to use the unique new Teleweld shimming method of restoring worn joint bars because the shim is installed quickly by unskilled labor.

But Teleweld Shims offer a *plus* advantage. The approximate cost is only *one-fourth* that of other methods. And the restoration job to original maximum efficiency is complete.

Teleweld Shims, designed for combined application to both top and bottom surfaces of the joint bar, compensate simultaneously for both the visible wear on top and the less visible wear but equally damaging wear the base of the bar. They level up drooped rail ends and restore original bolt take-up. A Teleweld Shim cannot move out of position or produce a cocked joint. Bar vibration is reduced to the minimum, resulting in improved joint condition, lesser joint and track bolt maintenance and the elimination of bond wire breakage.

Two sizes—1/32 inch and 3/64 inch—fit all weights of rail and types of bars. Test at our expense this unique, low-cost method of correcting joint bar wear. Write us on your letterhead, giving weight of rail and section, and we will send you one set each of the Teleweld Shim without charge.

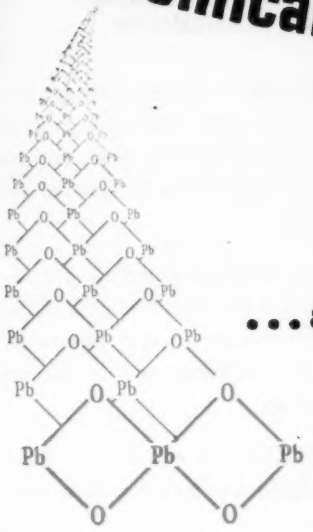
TELEWELD

TELEWELD, INC.

RAILWAY EXCHANGE BUILDING, CHICAGO 4, ILL.

New York • Cleveland • Salt Lake City • Boise • San Antonio
San Francisco • Washington • Los Angeles

Uniformity of Chemical Composition



. . . another real reason why RED LEAD means Extra Protection against Rust

Red Lead's outstanding uniformity of performance results not only from its extreme purity but also from its precise chemical composition . . . lead orthoplumbate. This makes for predictable chemical behavior.

For many years Red Lead has been the standard among metal protective paints because of inherent fundamental properties of the pigment itself.

Among the most important of these is Red Lead's definite chemical composition and uniformity—as distinguished from pigments which have indefinite composition or vary from batch to batch, with resulting possibility of variation in performance.

One reason for this uniformity is that Red Lead is a simple chemical compound, being made from oxygen and high purity metallic lead. Consequently, Red Lead is an extremely pure compound. It contains no corrosion accelerating impurities such as water-soluble salts of chlorides or sulfates.

Uniform composition means dependable performance, day after day, job after job.

Furthermore, Red Lead has the property of counteracting acid conditions, recognized as accelerators of rust. In the presence of various acids, Red Lead forms insoluble neutral lead salts at the approximate rate at which the acids are supplied. This is true whether the acids originate from acid forming environments, such as gas, smoke and moisture in the atmosphere, or from the decomposition of the vehicle. Thus, a rust inhibiting condition is maintained with a Red Lead paint.

Remember, too, that Red Lead is compatible with practically all vehicles commonly used in metal protective paints, including phenolic and alkyd resin types.

Specify RED LEAD for All Metal Protective Paints

The value of Red Lead as a rust preventive is most fully realized in a paint where it is the only pigment used. However, its rust-resistant properties are so pronounced that it also improves any multiple pigment paint. No matter what price you pay, you'll get a better paint for surface protection of metal, if it contains Red Lead.

Write for New Booklet

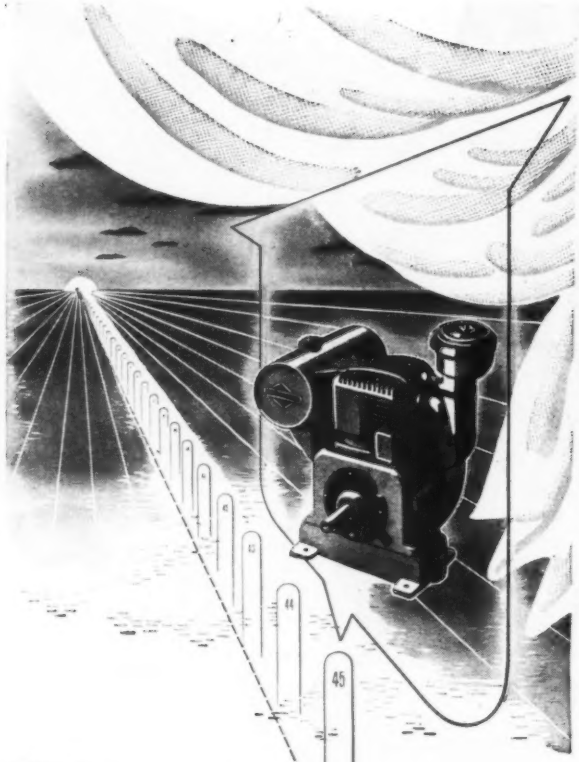
"*Red Lead in Corrosion Resistant Paints*" is an up-to-date, authoritative guide for those responsible for specifying and formulating paint for structural iron and steel. It describes in detail the scientific reasons why Red Lead gives superior protection. It also includes typical specification formulas. If you haven't received your copy, address nearest branch listed below.

* * *

The benefit of our extensive experience with metal protective paints for both underwater and atmospheric use is available through our technical staff.

NATIONAL LEAD COMPANY: New York 6, Buffalo 3, Chicago 80, Cincinnati 3, Cleveland 13, St. Louis 1, San Francisco 10, Boston 6 (National-Boston Lead Co.); Pittsburgh 30 (National Lead & Oil Co. of Penna.); Philadelphia 7 (John T. Lewis & Bros. Co.)

DUTCH BOY RED LEAD



THE *Know-How*
THAT COMES OF
25 YEARS' EXPERIENCE

It's the "know-how" in designing, engineering and precision manufacturing gained through 25 years of *continuous production* and constant refinement of *more than two million* Briggs & Stratton 4-cycle engines that have earned for them recognition as the world's finest, most dependable, air-cooled gasoline engines.

Air-Cooled Power 4 CYCLE BRIGGS & STRATTON GASOLINE ENGINES

This "know-how" is available to manufacturers of all types of appliances, tools and equipment, requiring dependable, compact gasoline power. The dependability, easy-starting, and economical performance of precision-built Briggs & Stratton engines — plus dealer and consumer preference — make them "preferred power" everywhere. BRIGGS & STRATTON CORP., Milwaukee 1, Wis., U.S.A.

Stop fire with DUGAS EXTINGUISHERS

Charged with PLUS-FIFTY DUGAS Dry Chemical

This is fast-acting protection that is YOUR safeguard against fire loss when you own a DUGAS EXTINGUISHER.

READY FOR ACTION . . . Dugas units are mobile, easy to handle and simple to operate. They never freeze up in winter; never require periodic recharge . . . yet can be quickly recharged on the spot.

SAFE . . . the dry chemical rolls up a heat-shielding screen for the operator and at the same time chokes the fire . . . it is non-toxic, non-corrosive, non-abrasive, and is not an electrical conductor.

FOR EXTRA-HAZARDOUS FIRES . . . in flammable liquids, solids and gases, and in electrical equipment.

Approved by Underwriters' Laboratories, Factory Mutual Laboratories, and Governmental Agencies.

AN ANSUL PRODUCT duGas THE MASTER OF FLAME

DUGAS 15-T HAND EXTINGUISHER

DUGAS 150 WHEELED EXTINGUISHER

ANSUL CHEMICAL COMPANY, MARINETTE, WISCONSIN
DUGAS DIVISION

YOU CAN'T JUST HAND A MAN A BRUSH AND SAY:

"PAINT THAT BRIDGE!"

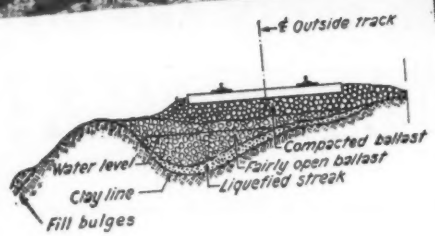
If that's all there was to it, bridge maintenance costs would be a lot lower than they are. Bridge painting, however, involves much more than the mere application of paint on steel.

Organization, management, equipment, materials . . . and just as important . . . specialized skill, are the vital factors that make it possible for Morrison to say, that because of our wide experience and knowledge of railroad practices . . . *we can do it better for less.*

It will cost you nothing to have one of our field experts survey . . . either a single bridge or your entire line . . . and submit an estimate or quotation based on your specifications. May we do it?

By planning your bridge painting early, available manpower can be scheduled assuring completion within the season.

MORRISON
RAILWAY SUPPLY CORP.
EXECUTIVE OFFICES . . . BUFFALO 12, N. Y.
CHICAGO 4, ILL. BIRMINGHAM 3, ALA.



Proper grouting with concrete stabilizes weak roadbeds, eliminates water pockets, thereby relieving the necessity of slow orders and greatly reducing the cost and labor needed to keep track in good condition.

FAST—ECONOMICAL—EFFICIENT

We are ready with personnel and equipment to handle speedily and efficiently your roadbed grouting requirements anywhere in the U.S.A., Mexico or Canada. All of our equipment is of the off-track type and has been specially designed by us in over 12 years' experience of pressure grouting work.

If your railroad requires track grouting, tunnel grouting, abutment grouting, test boring or work of a similar nature, we are ready to give your problems immediate attention.

Phone, write or wire now for a personal, immediate consultation with one of our qualified engineers. *Prices will be quoted on a track foot basis.*

JONES CORE DRILLING COMPANY

Phone Harwood 2806
2006 Industrial Blvd.

P. O. Box 5332
Dallas, Texas

Pressure Grouting

will solve your tough problems in Track Maintenance

Pressure grouting with portland cement transforms troublesome water pockets and chronic soft spots in railway subgrades into stable, worry-free sections.

Pressure grouting is a standard maintenance operation on many major railroads. It requires no capital expenditure. Work may be done by foreman and small gang of regular track laborers with simple equipment.

Years of experience on mainline tracks of major railroads have demonstrated that pressure grouting effects consistent saving in maintenance costs —saves thousands of man-hours of maintenance labor.

Write for illustrated information sheet, "Stabilizing Railroad Track by Pressure Grouting." Free in United States and Canada.

PORTLAND CEMENT ASSOCIATION
Dept. A3-27, 33 W. Grand Ave., Chicago 10, Ill.

A national organization to improve and extend the uses of concrete . . . through scientific research and engineering field work

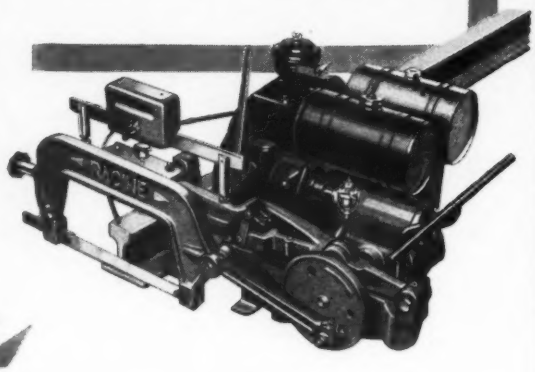
BUY AND KEEP MORE WAR BONDS

Driving grout injection point on inside of rail with spike-driving air hammer, on Burlington Railroad at Salem, Neb.

Grout injection points installed both inside and outside tracks of Burlington Railroad at Salem, Neb. Note grout hose connection at left front.

Workman feeling line at injection point to tell when grout has cleared so flow may be cut off at angle valve. Note track level board to warn if heaving occurs.

A RACINE *Portable* RAIL CUTTER will do the job



Faster...More Accurately... *with* Less Help...*at* Lower Cost

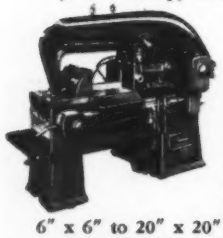
Use the RACINE Portable Rail Cutter for cropping rail when closing track, fitting new rail at turnouts, cross-overs, derails and crossings.

This portable machine is easily transferred from one job to another. Prominent roads everywhere use it extensively for frog and switch work, at interlocking plants, reclamation plants and in terminals.

Two men can carry the machine. One man operates it. Cuts fast, smooth and accurately. Sawing the rail eliminates tiny fractures that may lead to rail failure.

The standard machine will cut rail 7⅜" high by 6¾" wide; extra capacity model will handle rail 10" high by 6¾" wide. Both machines available with gasoline engine, electric or air motors.

Our Bulletin 58-A contains full details. Ask for your free copy today.



RACINE'S metal cutting saw line is complete

The RACINE line of saws includes models for high speed production and general shop work. Capacities 6" x 6" to 20" x 20" in all price ranges. Every model is equipped with the simplest and latest operating devices for the accurate cutting of any metal from soft aluminum tubing to hard alloy tool steels. Ask for Catalog No. 12. Racine Tool and Machine Company, 1738 State Street, Racine, Wisconsin, U. S. A.

RACINE

PUZZLE:

HOW TO PLACE MORE CONCRETE WITH LESS LABOR . . . WITHOUT DELAYING TRAFFIC?

A big order? Not with Rex Pumpcrete . . . the pump that pumps concrete through a pipe line! It's the modern, practical method that takes concrete placement out of the "lift and carry" class and makes it a simple pump and pipe-line operation.

For instance—the illustration shows a Pumpcrete and Rex 14S Mixer in action on the Norfolk & Western Railroad. Here the old masonry of two main bridge piers was encased in concrete. Rex Pumpcrete and Mixers were installed on existing spur track *450 linear feet* from the construction! Time and money were saved in the elimination of expensive preparatory work that would have been required with any other concrete placing system. What's more, the work was carried on without interference to normal rail traffic.

You'll find Rex Pumpcrete in use by many railroads, including the New York Central; Baltimore and Ohio; Chicago, Milwaukee & St. Paul; Norfolk & Western; Denver & Salt Lake; and many others. They use Pumpcrete because it's faster and more economical. The mixing is done off the right-of-way and the concrete is transported, elevated and placed in *one* operation—by pumping through pipe line.

For complete information on Pumpcrete, send for copy of Bulletin No. 464, Chain Belt Company, 1601 W. Bruce Street, Milwaukee 4, Wis.

REX **CHAIN BELT COMPANY.**

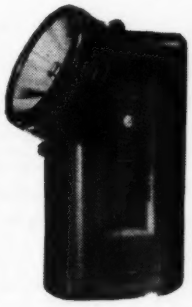
CONSTRUCTION MACHINERY

● And we mean *just that!* Here is your first line of defense against the hazards of fire . . . *Safety Approved Equipment.* Justrite Safety Products are specially designed to give maximum protection along the right-of-way and in the shops and are backed by safety approvals from the highest authorities.

JUSTRITE HANDY-SAFETY FLASHLIGHT

Users are going "all-out" for this mighty midget flashlight because it's handy, safe, dependable and rugged. It gives 1500 candlepower . . . has 3 standard cells and has all the famous Justrite safety features "sealed-in" a sturdy plastic case. It fits in the palm of your hand, on belt clip or will stand alone on its own base.

Tested and proven for safety by Underwriters' Laboratories, Inc., U. S. Bureau of Mines and the Bureau of Marine Inspection.



Model No. 17-S

JUSTRITE OILY WASTE CANS AND SAFETY CANS

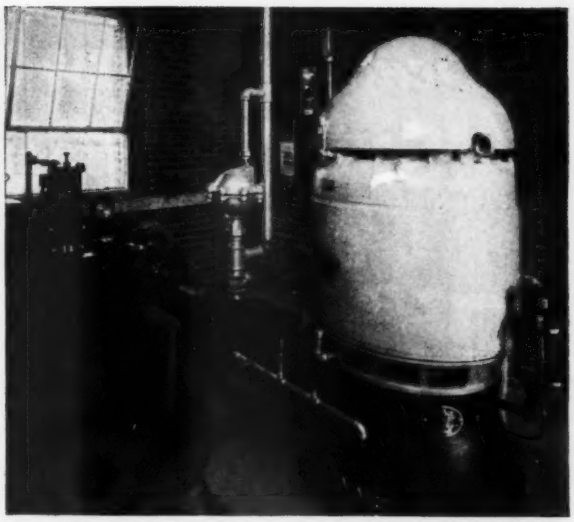
Safety Gasoline Can

The Safety Gasoline Can shown at left is ideal for the safe handling and storing of flammable liquids. This efficient, economical can is easy to carry, convenient to pour, fill and handle. The Oily Waste Can shown above in the flashlight beam is the safety approved container for dangerous, oily waste. These are just two of Justrite's famous line of Safety and Oily Waste Cans. Both cans are approved and labeled by Underwriters' Laboratories, Inc. and the Associated Factory Mutual Fire Insurance Companies for maximum protection against the hazards of fire.

See your supplier for specifications and prices

JUSTRITE MANUFACTURING COMPANY
2063 N. Southport Avenue, Dept. D-7, Chicago 14, Illinois

JUSTRITE *Safety Products*
SAFETY CANS · FILLING CANS · OILY WASTE CANS
APPROVED SAFETY ELECTRIC LANTERNS



VERY NEAT---

But Also Highly Efficient

The men who build Layne Well Water Systems like to turn out a neat job of pump, motor and control installation. But it is the engineers in the factory who are responsible for their extra high overall efficiency. First, they considered all of the well conditions—diameter, depth, static water level, capacity, drawdown and total head. Then the size and stages of the pumps, proper diameter and length of column pipe and line shaft and thus determined the right horse power to deliver the required amount of water into the user's system.

These same engineers created the pump design, specified the kind and size of bearings and saw that all parts were precision built of the finest quality materials. The result is a highly efficient, complete water system that will pay extra dividends in long life, low operation cost and freedom from mechanical faults.

Layne installed wells and Layne vertical turbine pumps are fully recognized by the most eminent engineers as being the finest in quality and the most efficient ever built. For over a half century, such a reputation has been maintained.

If you need more, either from additional wells, or from reconditioned old wells, write for further details. Address Layne & Bowler, Inc., General Offices, Memphis 8, Tenn.

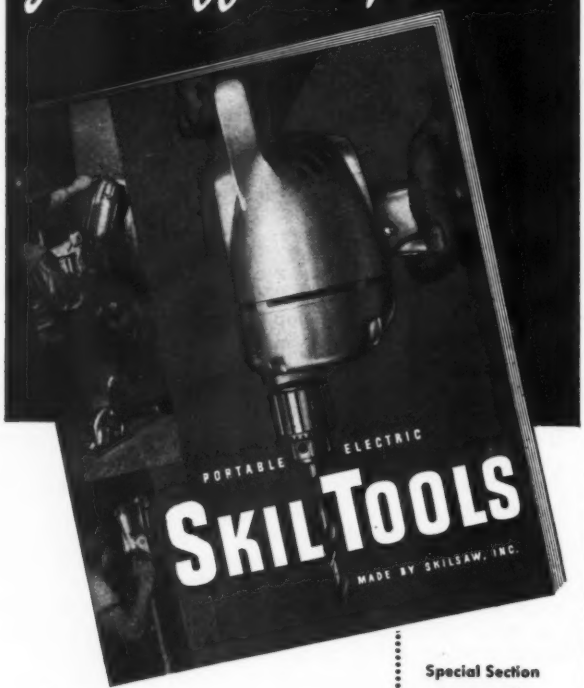
***LAYNE PUMPS**—fulfill every need for producing large quantities of water at low cost from wells, streams, mines or reservoirs. Send for literature.*

AFFILIATED COMPANIES: Layne-Arkansas Co., Stuttgart, Ark. • Layne-Atlantic Co., Norfolk, Va. • Layne-Central Co., Memphis, Tenn. • Layne-Northern Co., Mishawaka, Ind. • Layne-Louisiana Co., Lake Charles, La. • Louisiana Well Co., Monroe, La. • Layne-New York Co., New York City • Layne-Northwest Co., Milwaukee, Wis. • Layne-Ohio Co., Columbus, Ohio • Layne-Texas Co., Houston, Texas • Layne-Western Co., Kansas City, Mo. • Layne-Western Co. of Minnesota, Minneapolis, Minn. • International Water Supply Ltd., London, Ontario, Canada.

LAYNE

WELL WATER SYSTEMS
VERTICAL TURBINE PUMPS

Send FOR THIS NEW SKILTOOL CATALOG and MAINTENANCE MANUAL *just off the press!*



● Every owner, every operator of portable electric tools needs this manual to help make tools do their job better and last longer. The SKILTOOL Maintenance Manual in the SKILTOOL CATALOG is packed full of useful information on the care and economical use of *all* portable electric tools. Whether you use SKILTOOLS exclusively . . . or whether you also use other makes . . . you'll save money and delay the need for tool repair by reading and heeding the advice in the new SKILTOOL Maintenance Manual and Catalog. It's yours for the asking. Mail the coupon today!

Special Section on care and operation of Electric Tools, including:

DO'S AND DON'TS that help make tools last longer

CARE OF MOTORS, etc.

How to get the most from your portable electric tools

SKILSAW, INC., 5033-43 Elston Ave., Chicago 30, Illinois
Please send.....free copies of your new SKILTOOL Catalog with Special Tool Maintenance Section to:

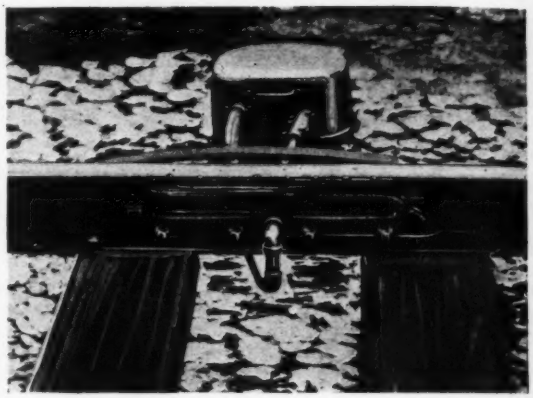
Name.....

Address.....

City.....*State*.....

SAVE STEEL *with* ARDCO

Rail and Flange Lubricators



Ardco Automatic Rail and Flange Lubricator

THE "Ardco" model is operated by the recurrent wheel depression of a drive spring, thereby causing grease to flow from precisely positioned ports—so located that grease contacts the flange of each passing wheel—thus efficiently lubricating both flange and rail as the curve is traversed.

The "Sesmo" type is similarly effective. This lubricator, however, is actuated by rail wave motion and is not dependent upon wheel impact.

Both "Ardco" and "Sesmo" lurbicators greatly prolong the life of curve rails—tire turning is minimized—curve resistance is reduced—safety is increased—and steel is saved!

ARDCO MANUFACTURING COMPANY
1116-1118 Paterson Plank Road N. Bergen, N. J.

Sesmo Automatic Rail and Flange Lubricator

A "Burro" for Work

For any job of loading, unloading, handling, excavating, building, hauling or dismantling, the BURRO Crane is really a "Burro" when it comes to doing the job better, cheaper, easier and faster. Name your job and the chances are that Burro can save you time and money too.

Short tail-swing . . . Independent clutches for each operation . . . Drawbar pull up to 7500 lbs. . . . speeds up to 27 m.p.h. Elevated boom heels . . . low over-all height . . . sets itself off and on track . . . equipped with fittings for using buckets, magnets, etc. . . . Does its own hauling, switching.

Operators like the Burro because it handles easily. Everyone likes it because it can do so many kinds of work efficiently and economically.

Write for bulletins F-115 and F-120. You too may find Burro indispensable.

CULLEN-FRIESTEDT CO.
1301 S. Kilbourn Ave. Chicago 23, Illinois

PHOTO COURTESY CARNEGIE-ILLINOIS STEEL CORP.

BURRO CRANES

SYNTRON
GASOLINE HAMMER
SPIKE DRIVERS
and
PAVING BREAKERS
100% Self-Contained

Easy to Start—
one quick pull
of the rope.

Extremely Portable

Ruggedly Constructed

No Compressor
No Hose

No Battery Box
and Cable

No Springs

SYNTRON CO., 290 Lexington, Homer City, Pa.

Track Appliances for SAFETY AND ECONOMY

Use Q&C UNIVERSAL TYPE GUARD RAIL CLAMPS

designed to adequately meet the demands of present day heavy traffic conditions.
Our clamps are fitted with a drop forged, heat treated, steel yoke of "I" Beam construction; one size of yoke suitable for a large range of rail sections.

OTHER Q AND C APPLIANCES:

Switch Point Guards—One Piece Manganese Guard Rails—Wheel Stops—Derails—Gauge Rods—Compromise Joints—Car Replacers—Snow Flangers and Plows—Skid Shoes—Anti-Slip Rail Tongs—Flangeway Brackets—Foot and Heel Guards—Electric Snow Melters—Gauging Tools.

MEMBER 1945 NATIONAL RAILWAY APPLIANCES ASSN.

THE Q AND C COMPANY

CHICAGO 90 WEST STREET, NEW YORK, N.Y. ST. LOUIS

FOR HIGH SPEEDS
Under Heavy Loads
The
Morden
"Security"
SPLIT SWITCH
Assures
SAFE OPERATION

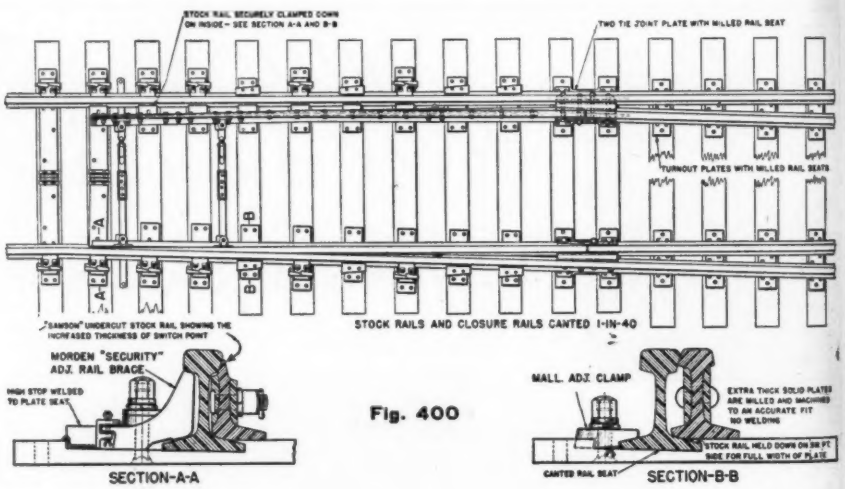

STOCK RAIL SECURELY CLAMPED DOWN ON INSIDE – SEE SECTION A-A AND B-B
TWO TIE JOINT PLATE WITH MILLED RAIL SEAT
TURNOUT PLATES WITH MILLED RAIL SEATS
STOCK RAILS AND CLOSURE RAILS CANTED 1-IN-40
"SAMSON" UNDERCUT STOCK RAIL SHOWING THE INCREASED THICKNESS OF SWITCH POINT
MORDEN "SECURITY" ADJ. RAIL BRACE
HIGH STOP WELDED TO PLATE SEAT
SECTION-A-A
MALL ADJ. CLAMP
EXTRA THICK SOLID PLATES ARE MILLED AND MACHINED TO AN ACCURATE FIT AND WELDING
STOCK RAIL HELD DOWN ON 20 PC SIDE FOR FULL WIDTH OF PLATE
CANTED RAIL SEAT
SECTION-B-B

Fig. 400

Designed and built to conform to either A. R. E. A. or customer's specifications, the complete assembly of the Morden Security Split Switch combines the Samson Heavy Duty Switch Point and the Betts switch plate. These details are designed to assure safe operation and promote substantial reductions in maintenance costs.

As additional protection against the shocks of heavy traffic, the switch is braced with a Morden Security Adjustable Rail Brace especially designed for use on split switches.

The services of Morden engineers are available at all times to help you in your maintenance problems.

MEMBER 1945 NATIONAL RAILWAY APPLIANCES ASSN.

Morden Frog and Crossing Works CHICAGO, ILL.

Representatives in: CLEVELAND, OHIO; NEW ORLEANS, LA.; LOUISVILLE, KY.; ST. LOUIS, MO.; WASHINGTON, D. C.

STOP...

Ripping up your old wood flooring... Chopping rutted and broken concrete... Expensive labor and delays

The problem of maintaining factory floors, driveways, trucking aisles and platforms is greatly reduced and operating efficiency increased when ruts and holes are eliminated *The One Easy Way.*

STONHARD RESURFACER is sparkproof, non-slipping, non-dusting, fire- and water-resistant. Bonds perfectly to feather-edge over concrete, wood, brick or composition.

The more punishment STONHARD RESURFACER receives under heavy traffic the more it compacts without chipping.

A complete overlay or patch with STONHARD RESURFACER will give you *a smooth, tough, and resilient surface* that is long-lasting and will withstand the heaviest trucking and traffic.

YOUR OWN WORKMEN CAN APPLY STONHARD RESURFACER EFFICIENTLY

ORDER A DRUM NOW

Complete Overlays and Repairs with STONHARD RESURFACER
Over Concrete... Wood... Brick... Composition

30 OTHER STONHARD BUILDING MAINTENANCE MATERIALS FOR EVERY BUILDING MAINTENANCE NEED.

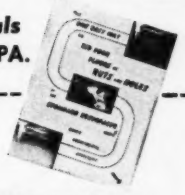
TRIAL OFFER: We will send a drum of STONHARD RESURFACER to any responsible firm on our trial basis . . . test its performance under actual working conditions for 30 days. . . . NO CHARGE UNLESS SATISFACTORY.

STONHARD COMPANY

Established in 1922

Building Maintenance Materials
401 N. BROAD ST., PHILADELPHIA 8, PA.

SEND FOR THE NEW "ONE EASY WAY" FOLDER



STONHARD COMPANY
1323 Callowhill St.
Philadelphia 8, Pa.

Sirs: Please send me your new "One Easy Way" Folder and detailed information on STONHARD RESURFACER.

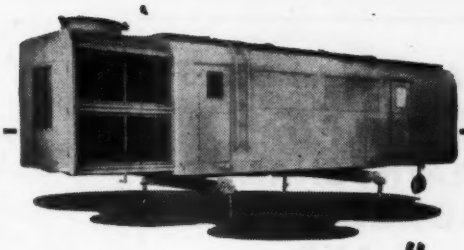
Our floors are: Concrete ☐ Wood ☐ Brick ☐ Composition ☐

FIRM _____ _____

MR. _____ TITLE _____

ADDRESS _____

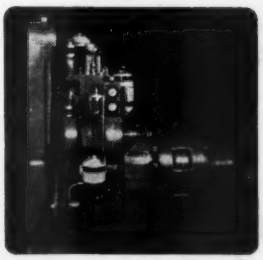
CITY _____ ZONE _____ STATE _____



"Power to Spare" ...IS EXPENSIVE

THE NAVY FITS THE POWER PLANT TO THE JOB

NAVY engineers know that operation of a large power unit to carry a light load is injurious to its continued efficient operation. It also wastes fuel. That's why they provide a 5KW Sheppard Diesel Auxiliary Generating Set in the 600 KW portable generating plant shown at top. This auxiliary unit is used when the power load is only a fraction of the main plant's capacity. It's also available for *emergency* lighting while the main plant is being serviced.



5 KW Model 7 Sheppard Diesel Generating Set used as a standby for lighting in and around the 600 KW portable power plant shown above. 4" bore x 5" stroke; single cylinder; rated at 8 HP at 1200 RPM; variable speed governor control with 4% regulation; simplified Sheppard Fuel Injection System.

If there are times when *your* power requirements are below normal, take a tip from the Navy. Cut operating and maintenance costs. Install a Sheppard Diesel Auxiliary Generating Set. It provides low-cost electricity . . . low-cost power . . . because it operates efficiently on the cheapest fuel obtainable. A limited number are now available. Let us advise you how to obtain WPB approval. Mail coupon for free literature today.

Power Units; 8 to 50 HP
Generating Sets; 3 to 30 KW

Sheppard ALL AMERICAN **DIESEL GENERATING SETS**

R. H. Sheppard Company, 636 Middle St., Hanover, Pa.

Please send me free literature describing Sheppard Diesel Generating Sets.

Name _____

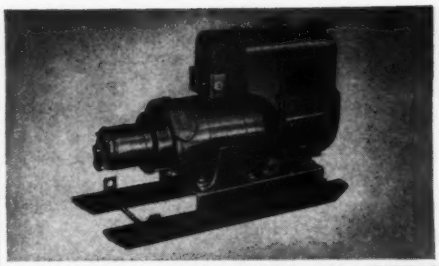
Firm Name _____

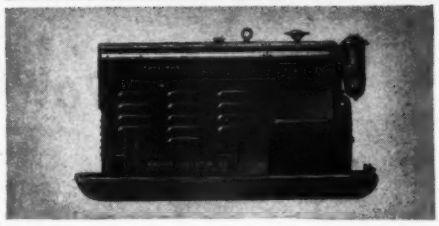
Address _____

Of special interest to

RAILROAD MAINTENANCE SUPERVISORS AND PURCHASING AGENTS

Complete specifications, details of construction, and full illustrations of Master Gas Electric Plants to meet any railroad electric power or lighting need in maintenance of ways, camps, construction projects, etc., is provided in a 40 page engineering manual published by the Master Vibrator Company. You may obtain a copy of this informative book, without charge or obligation, simply by writing Department of Information, Master Vibrator Company, Dayton 1, Ohio.





Eleven basic sizes from 500 watts to 17,000 watts and 30 different types to meet all AC or DC power or lighting requirements. Housed or open models . . . available with wheelbarrow, buggy or trailer mounting. For operating a single tool or motor, or floodlight . . . or gangs of tools, groups of motors, or lighting entire areas. Easy to put in operation . . . economical to operate and maintain. Compact, portable, self-contained.

For complete details write for Bulletin 594.

MASTER GAS-ELECTRIC GENERATING PLANTS

COMPACT PORTABLE

SAVE TIME AND SPEED WORK WHEREVER POWER OR LIGHTING IS REQUIRED

MASTER VIBRATOR COMPANY

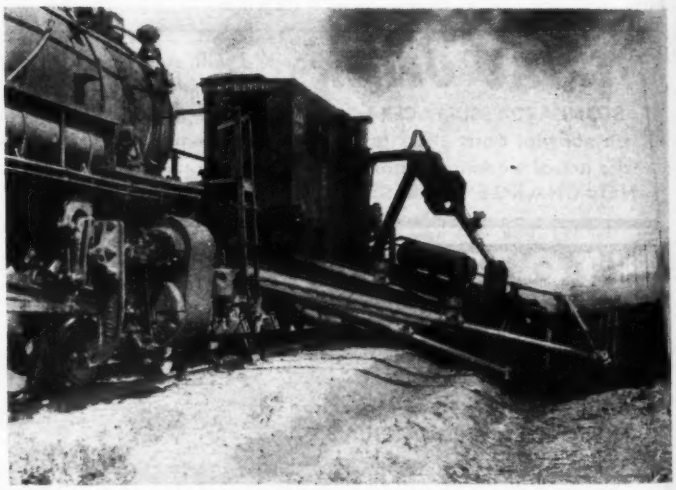
Dayton 1, Ohio • Distributors throughout United States and Canada

Products Include: Concrete Vibrators, Gas or Electric Surfacing Attachments, High Speed Tools • Vibratory Concrete Finishing Screeds • Rotary Concrete Floor Finishing Machines • Portable Gas Electric Generator Plants, 500 Watt to 17000 Watt, Voltage Regulators and Portable Mountings Optional • Master Flood and Shovel Lights • Electric or Gas Engine Driven Power Blow Hammers

JORDAN

Spreader-Ditcher

Because the JORDAN Spreader-Ditcher is especially designed for spreading, ditching and roadbed shaping, it can be an important factor in helping your railroad solve these problems efficiently and speedily.



MEMBER 1945 NATIONAL RAILWAY APPLIANCES ASSN.

Speeds Ditching and Roadbed Shaping on Both Sides, Up To 20 Miles a Day

Does the work of an army of men!

O. F. JORDAN COMPANY EAST CHICAGO INDIANA

Walter J. Riley, *President*

Death to Weeds on rights-of-way...

NON-POISONOUS

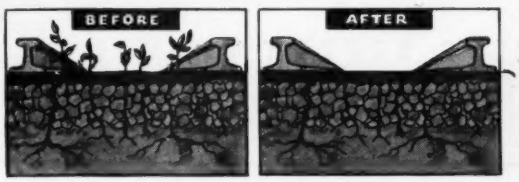
Sterling

ROCK SALT

PREVENTING weed growths on rights-of-way . . . instead of attacking them after they gain strong foothold . . . keeps tracks seasonally free of rank, quick-thriving vegetation.

Applied to weeds at their earliest stage, Sterling Rock Salt speedily nips the tender roots. It kills growths at their source. It prevents fresh offshoots from taking hold. Fire hazards from dead vegetation are eliminated... drainage disruptions ended.

Sterling Rock Salt should be applied in early spring. When mixed with rainwater, it filters into roadbeds as brine . . . thus hastening its efficient toxic action. But strong as its action is, this agent is *non*-poisonous . . . safe for straying livestock.



Initial treatment requires only 2 to 3 lbs. of salt per sq. yd. . . . yearly maintenance thereafter drops to 1 to 2 lbs. per sq. yd. to prevent recurrence. For complete details, methods of distribution, etc. . . . write requesting an International field engineer to call.

EXTRA! Free Bulletin Gives Whole Story!

Here are the *facts* on quick, thorough elimination of weed growths on rights-of-way. Read how tests by major U.S. railroads have proved the swift efficiency of Sterling Rock Salt. Complete with illustrations and diagrams, a copy is yours upon request. Just fill out coupon below and send in.

International Salt Company, Inc.
Dept. REM3, Scranton, Pa.

Please send a copy of your booklet on Weed Elimination for Railroads

*Name*_____

*Company*_____

*Street*_____

*City*_____ *State*_____

Sterling ROCK SALT Eliminates Weeds

INTERNATIONAL SALT COMPANY, INC., Scranton, Pa.

Mall

REG. U.S. PAT. OFF.

MAINTENANCE Makes Tracks Last Longer

Mall Portable Rail Grinder

★ ***Off-The-Track***
★ ***Easily Portable***
★ ***Efficient***
★ ***Safe***
★ ***Economical***

Where MALL Rail Grinders keep rails and switchpoints in fighting trim, you'll find longer rail life, better fitting and acting switches, less rail and road bed maintenance, plus reduced shock on rolling equipment.

MALL Rail Grinders can be wheeled anywhere on the right-of-way. The variable speed, 6 H.P. easy-starting, gasoline engine and heavy duty flexible shafting make the unit readily adaptable to rail, frog, crossing and switchpoint grinding. Patented slip-lock detail on ends of flexible shaft and various attachments reduce tool changing time to a minimum. Unit is ruggedly constructed to stand up under hard continuous usage.

Other MALL Portable Power Tools include Cross Slotters, Gasoline Engine, Pneumatic and Electric Concrete Vibrators and Surfacers, Gasoline Engine and Pneumatic Chain Saws, Electric Circular Saws, Electric Drills, Flexible Shaft Machines with attachments for sanding, grinding, polishing, wire brushing, buffing and drilling. Write for complete catalog to

Railroad Department

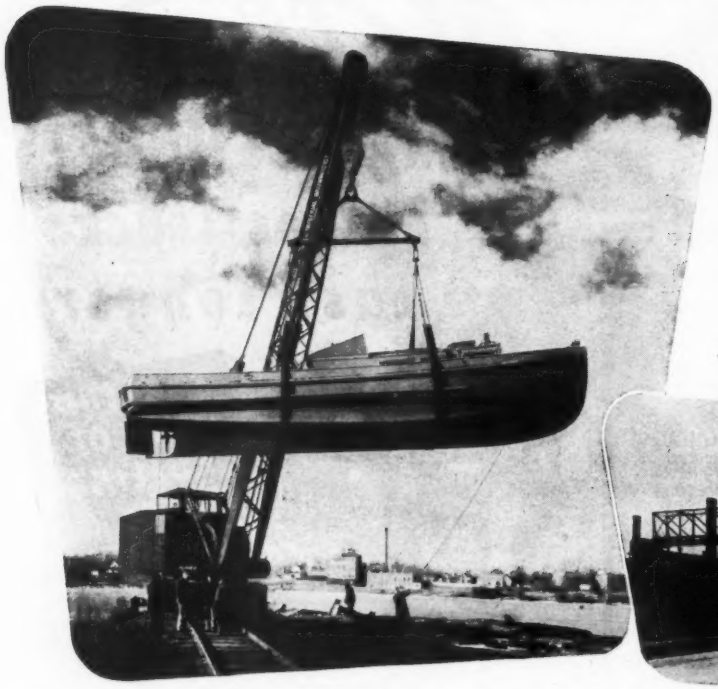
MALL TOOL COMPANY

7746 South Chicago Avenue, Chicago 19, Illinois

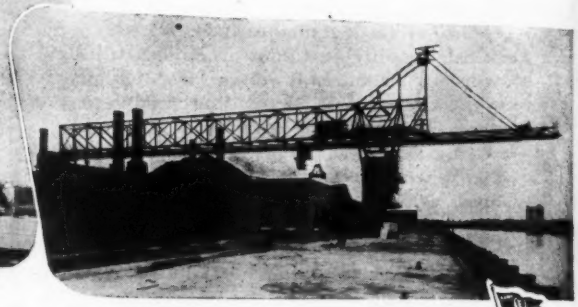
Offices in Principal Cities

Mall REG. U.S. PAT. OFF. **PORTABLE POWER TOOLS**

MATERIALS MOVE FAST when I. B. equipment is on the job



Typical of I. B. engineering and construction superiority is the 4-5 Ton Traveling Bridge, pictured below, which unloads and stores coal from boats at a large eastern power plant. Left: I. B. Diesel locomotive cranes may be found hard at work with magnet, hook, or bucket, nearly the world over. Patented Monitor-type cab provides 360° visibility and better ventilation. Regardless of your material handling problems, get the facts from I. B.



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INDUSTRIAL BROWNHOIST CORP. • BAY CITY, MICH. • DISTRICT OFFICES: New York, Philadelphia, Cleveland, Chicago • Agencies: Detroit, Birmingham, Houston, Denver, Los Angeles, San Francisco, Seattle, Vancouver, B.C., Winnipeg, Canadian Brownhoist Ltd., Montreal, Quebec.

BUILDERS Propeloflo METER

This improved propeller-type meter totalizes flow in main water lines. Streamline Venturi design gives exceptional accuracy over a wide range with low loss of head. Simple to install, economical to maintain. Send for Bulletin 350 and complete information. Address Builders-Providence, Inc., (Division of Builders Iron Foundry), 9 Codding St., Providence 1, R. I.

Sincerely

BUILDERS-PROVIDENCE

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CLASSIFIED ADVERTISEMENTS, $10.00 an inch, one inch deep by three inches wide, an insertion.

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Remittance must accompany each order.

Railway Engineering and Maintenance
Classified Advertising Department
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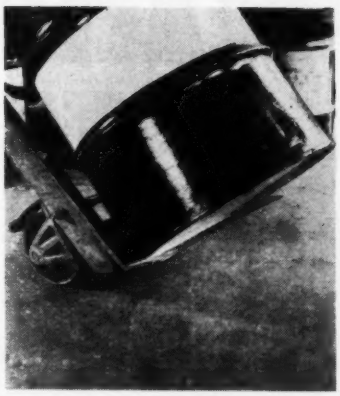
Immediate delivery

100% Joints for 100 lb. ARA-A RAILS

1,250 pairs 28" ANGLE BARS. Weight: 80 lbs. per pair.
Bolt hold spacing: 5" x 4" x 4" x 4" x 5".
Holes alternate round: 1⅛", and oval: 1⅛" x 1⅜".
Spike slots: 13/16" x 1⅜"; 1½" and 5½" from each end.

ADDRESS E. C. SHERWOOD, 50 CHURCH STREET, NEW YORK 7, N. Y. Telephone Cortlandt 7-3322

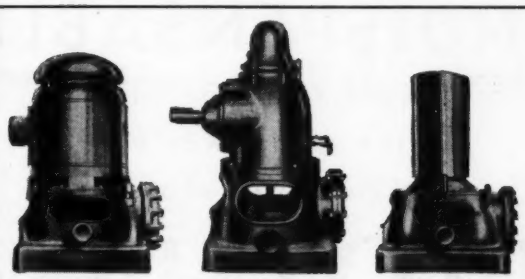
Keep Floors Level—Speed Traffic with *Quick-Floor*



Repair or Resurface . . .
Inside or Outside . . .
STATION PLATFORMS
COACH YARDS · FREIGHT YARDS · BAGGAGE ROOMS . . . DRIVEWAYS

QUICK-FLOOR is ready-mixed—is easily laid (a square foot a minute)—sets by pressure—requires no drying time—can be used as soon as laid—outwears the original concrete. . . . Unconditionally guaranteed. . . . Write or phone today for help on your specific problems.

Quick-Floor
Made By DURA-TRED COMPANY
355 N. Central Park Blvd. • Chicago 24, Ill. • Van Buren 2171



MOTURBO GEARTURBO BELTURBO

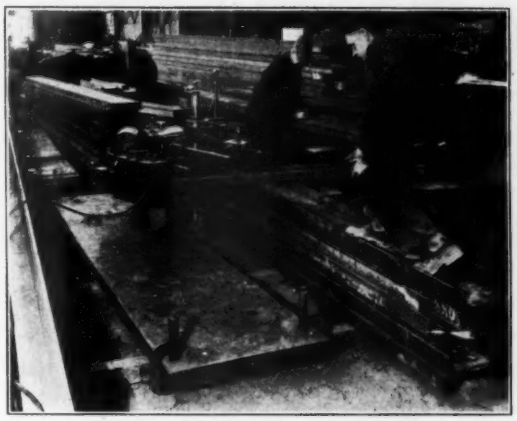
Railroads need unfailing water

Thousands of Peerless Pumps have been in operation for more than 10 years without need for repair. Precise factory methods insure continued operation. Because of the exclusive engineering design, construction and fine workmanship of the bowl and impeller assembly, original efficiencies are closely maintained over a greatly extended performance period.

FEATURES—*(Turbine Type)*
Water-cooled head bearings • Choice of oil or water lubrication • Double Bearings in each bowl • Fully-enclosed impellers • Double Seal impellers.

PEERLESS PUMPS
PEERLESS PUMP DIVISION
Food Machinery Corporation
TURBINE HI-LIFT HYDRO-FOIL
301 W. Ave. 26, Los Angeles 31, Calif. • 1250 Camden Ave. S.W., Canton 6, Ohio • Other Factories: San Jose 5, Fresno 16, Calif.

THE "TOGGLEBUG"



PORTABLE DRILL
DRILLS—REAMS—COUNTERSINKS

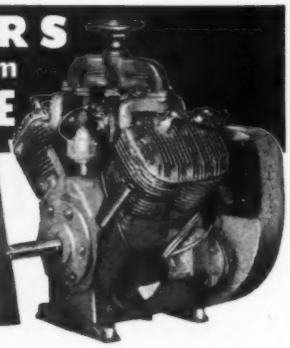
Speed car building and car repairs with this unique portable drill press. The Togglebug drills any size shape or plate and is ideal for use on stacked plates using a single layout. The Togglebug rides the work and can be used in the shop or the yard, on the cars or beside the track. Take the Togglebug to the work and save material handling. One man operation saves time, reduces manpower.

The Togglebug is adaptable in all shops regardless of other drilling equipment. Stack and drill cover plates for center sills. One car shop drills 1760 holes in eight cover plates at one time in eight hours. Improve your production with a Togglebug.

Write for details.

GUIBERT STEEL COMPANY
1716 Youghiogheny Ave., Pittsburgh 30, Pa.
P. O. Box 1837

CYLINDERS
are separate from
CRANKCASE
on all
WISCONSIN
4-Cylinder V-Type
Air-Cooled
ENGINES



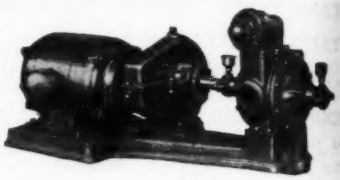
The cylinders on all V-type Wisconsin Air-Cooled Engines are cast in pairs, separate from the crankcase, for quick, economical servicing when required. In case a cylinder is accidentally scored beyond the possibility of reboring, it is only necessary to replace a relatively inexpensive pair of cylinders instead of an entire engine block. The picture shows the Model VE-4 Wisconsin Engine, with protective shrouding removed, illustrating method of attaching cylinders.

Most H.P. per pound
WISCONSIN MOTOR
Corporation
MILWAUKEE 14, WISCONSIN, U. S. A.
World's Largest Builders of Heavy-Duty Air-Cooled Engines

for Handling FUEL OIL,
LUBE OIL and Similar Liquids
Investigate
BLACKMER
ROTARY
PUMPS

SELF-ADJUSTING FOR WEAR

"Bucket Design" swinging vanes automatically compensate for wear. When the "buckets" finally wear out, a 20-minute replacement job restores the pump to normal capacity.



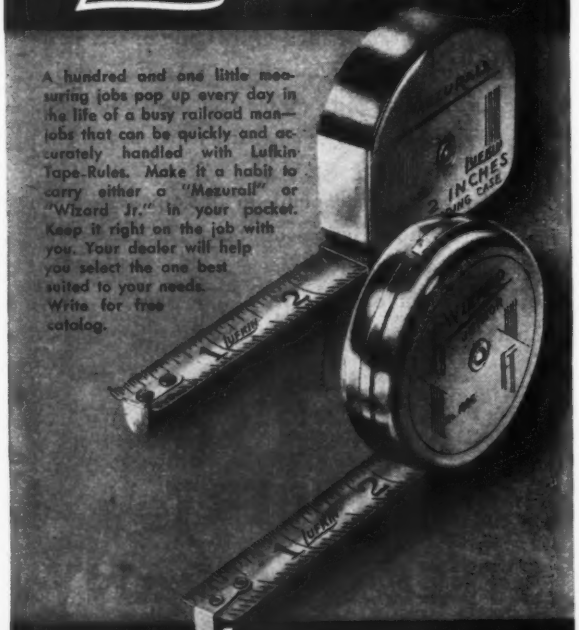
Write for Bulletin No. 306—Facts About Rotary Pumps

BLACKMER PUMP COMPANY
2140 Century Avenue — Grand Rapids 9, Michigan

POWER PUMPS · HAND PUMPS
· EZY-KLEEN STRAINERS ·

LUFKIN TAPE-RULES

A hundred and one little measuring jobs pop up every day in the life of a busy railroad man—jobs that can be quickly and accurately handled with Lufkin Tape-Rules. Make it a habit to carry either a "Mezurall" or "Wizard Jr." in your pocket. Keep it right on the job with you. Your dealer will help you select the one best suited to your needs. Write for free catalog.



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SAGINAW, MICHIGAN · NEW YORK CITY
TAPES · RULES · PRECISION TOOLS

INDISPENSABLE
for E-X-T-E-N-D-I-N-G
the manpower of
America's railroads
BLOXHAM
Track Liners

Write for Folder

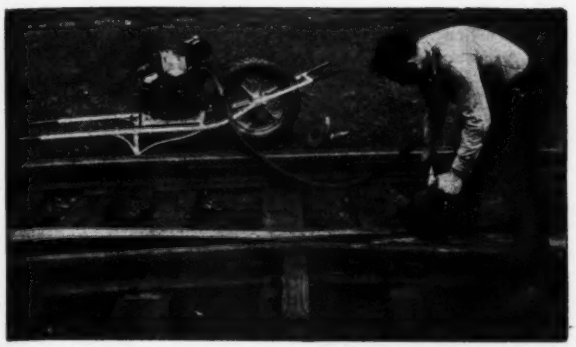
For modernizing track alignment methods, the BLOXHAM Track Liner is an improved type of equipment. It's fast, easy and accurate . . . a straight pull on the rail. No lifting, stooping or "heeling up". A good item for Supply Houses to handle. Write for dealer proposition.

CHICAGO STEEL FOUNDRY COMPANY
3701 S. KEDZIE AVE., CHICAGO 32, ILL.

Speed Rail Maintenance in spite of The Manpower Shortage

Railway Track-Work Grinders enable you to maintain rails in the best possible condition, speedily, efficiently, with minimum use of manpower. We make all types of grinders for work on rails, switches, frogs etc.

Write for the latest data bulletins.



Model P-22 RTW Free-Hand Grinder—one of many models.

Railway Track-work Co.

3207 Kensington Avenue, Philadelphia 34, Pa.

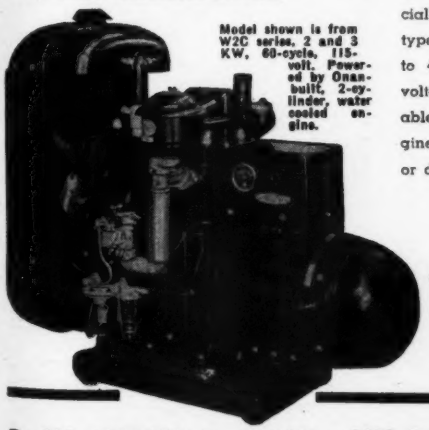
7365

ELECTRICITY For Railroad Work *Anywhere!*

ELECTRIC PLANTS Onan

Onan Electric Generating Plants provide sure, on-the-spot electric power to meet many situations and applications in the Railroad Industry. Indispensable for maintenance work, signal systems, service and general lighting, repair shops, emergencies and other uses.

Driven by Onan-built, 4-cycle gasoline engines, these power plants are of single-unit, compact design and sturdy construction. They are suitable for intermittent or heavy duty, continuous service.



Model shown is from W2C series, 2 and 3 KW, 60-cycle, 115-volt. Powered by Onan-built, 2-cylinder, water cooled engine.

Models range from 350 to 35,000 watts. A.C. types from 115 to 660 volts: 50, 60, 180 cycles, single or three-phase; 400, 500, and 800 cycle, single phase; also special frequencies. D.C. types range from 6 to 4000 volts. Dual voltage types available. Write for engineering assistance or detailed literature.

Over 250,000 Units in Service

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Straightens Ties with Minimum Manhours
Simplex G-Y Tie Spacer
As never before, Simplex G-Y Tie Spacers are proving their worth today by effecting more accurate tie spacing with less manpower, and at the same time eliminating tie damage. Easily slid from tie to tie. Instantly disengaged from rail. Easy to transport.
Simplex
LEVER · SCREW · HYDRAULIC
Jacks
Templeton, Kenly & Co., Chicago (44), Ill.
Better, Safer Jacks Since 1899

HERE'S THE NEW QUICK WAY TO FIX BROKEN CONCRETE FLOORS

Tamp! Truck Over! No Wait for Setting!

Use durable INSTANT-USE . . . a tough, plastic material which you simply shovel into hole—tamp—and run traffic over immediately. NO WAITING. Bonds tight to old concrete. Makes smooth, solid, heavy-duty patch. Withstands extreme loads. Keep a drum on hand for emergencies. Immediate shipment.

REQUEST DESCRIPTIVE FOLDER and Details of FREE TRIAL OFFER

INSTANT-USE

FLEXROCK COMPANY

3647 Filbert St., Philadelphia 4, Pa.

Please send me complete INSTANT-USE information and details of FREE TRIAL OFFER—no obligation.

Name .....

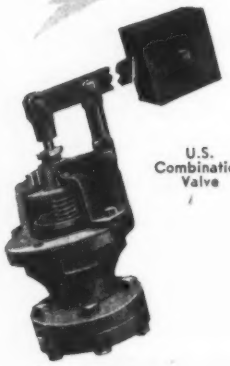
Company .....

Address .....

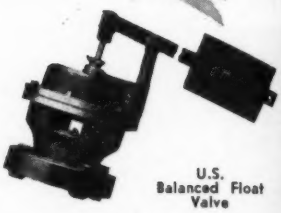
VALVES

For a dependable water supply

When a smooth, uninterrupted water supply is needed, you can depend on U. S. and Halladay Valves. A combination of styles is offered to suit particular water supply requirements. You are assured the best in valve service when you get U. S. or Halladay Valves.



U.S. Combination Valve



U.S. Balanced Float Valve

Halladay Outlet Valve

Floats (not shown) are integral part of Valves

U. S. Engine & Pump Co.

Division of Batavia Metal Products, Inc.

BATAVIA • ILLINOIS

Write for Valve Circular X

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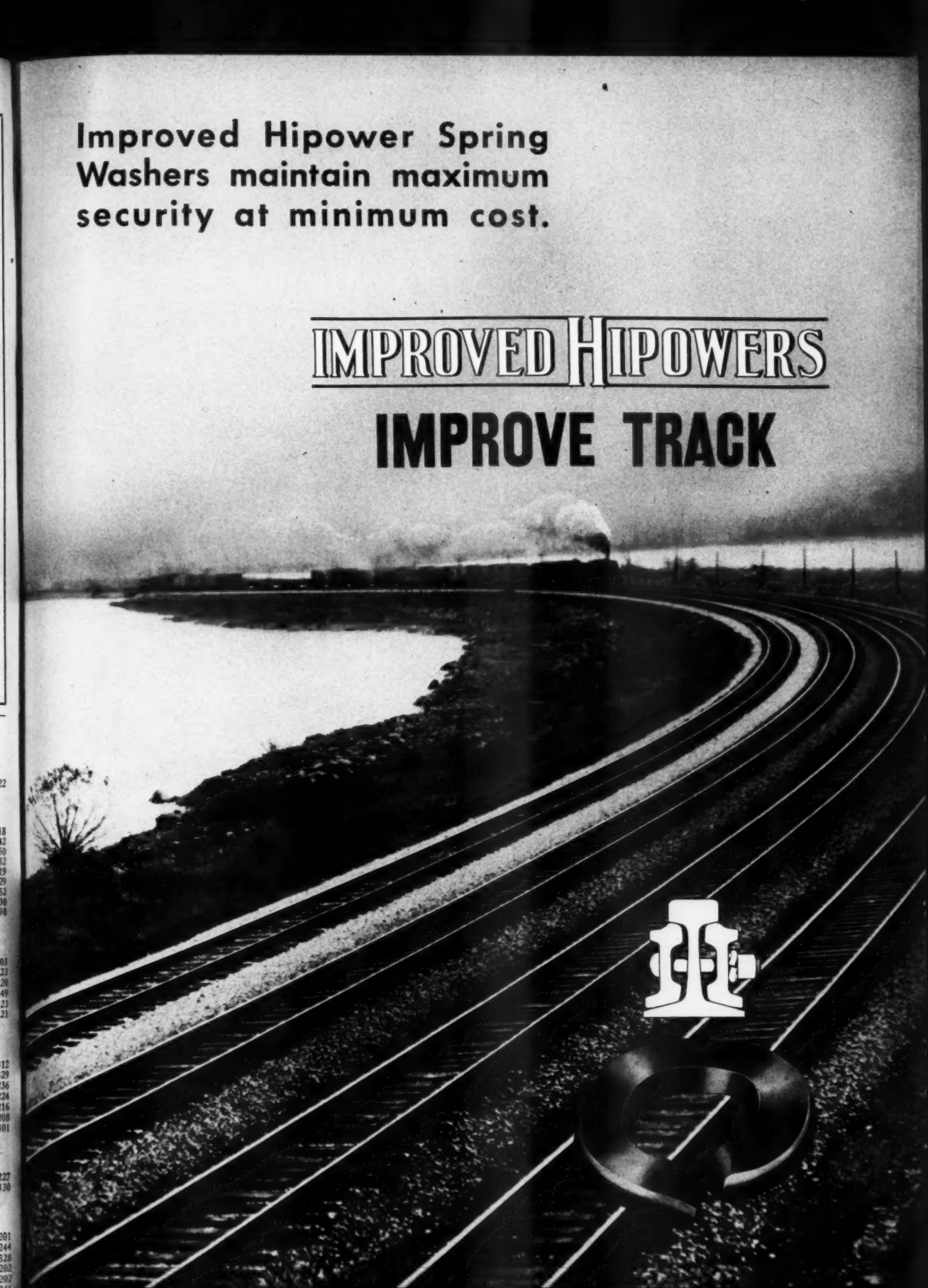

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